On The Cost Of Simulating A Parallel Boolean Automata Networks By A Sequential One

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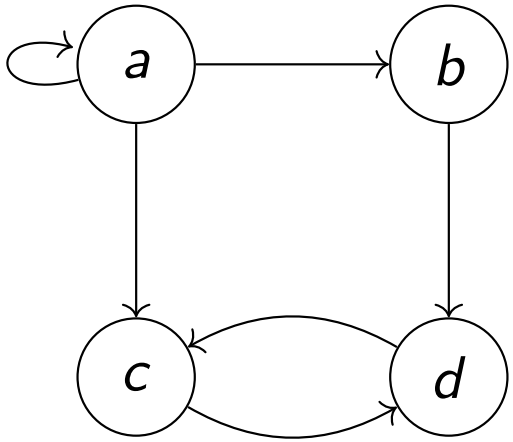
Collaborators: Sylvain Sené (LIF) et Guillaume Theyssier (I2M), Adrien Richard (I3S), Pierre Guillon (I2M), Kévin Perrot (LIF)

Boolean automata networks (BAN)



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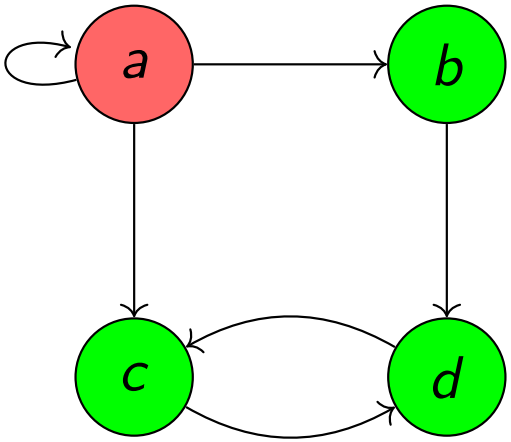

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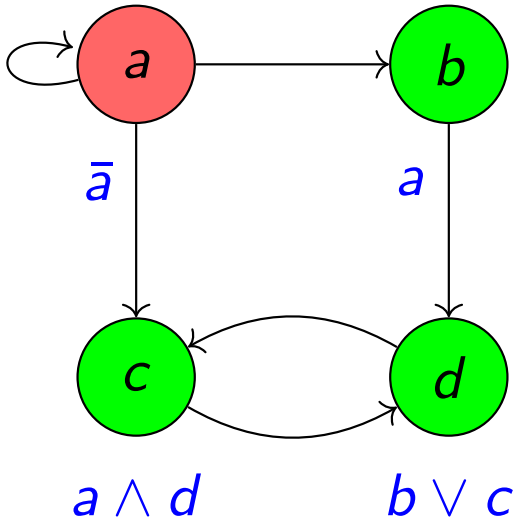

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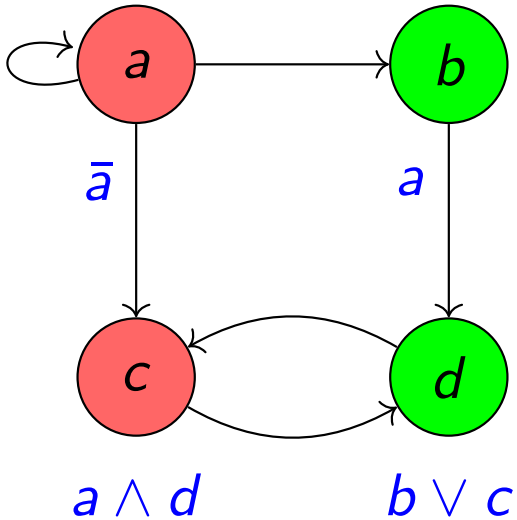

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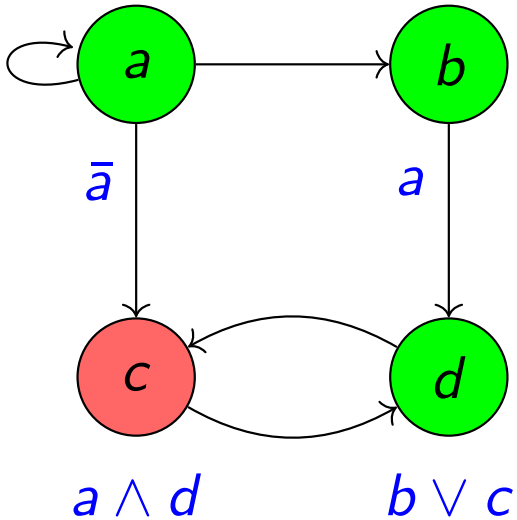

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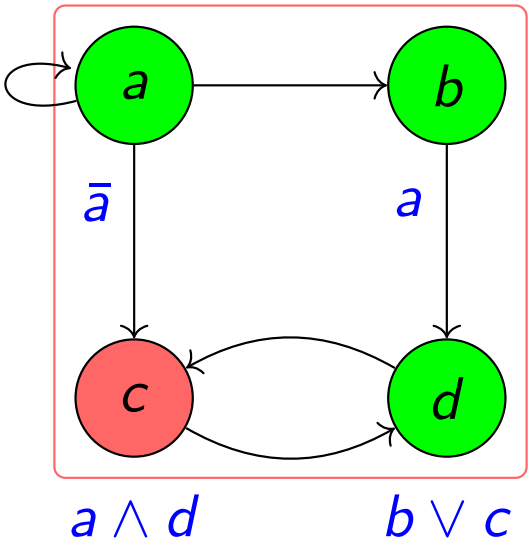

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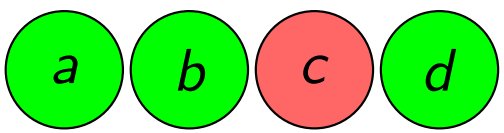

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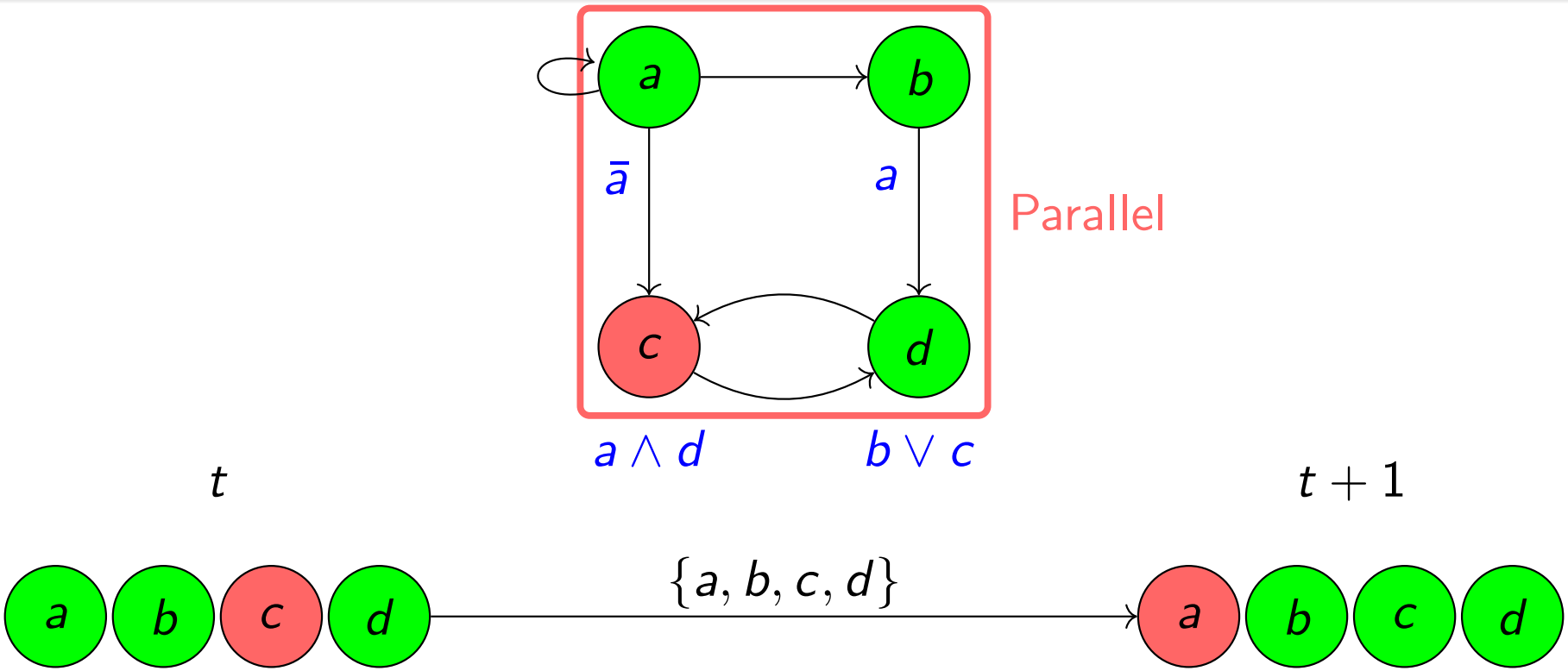

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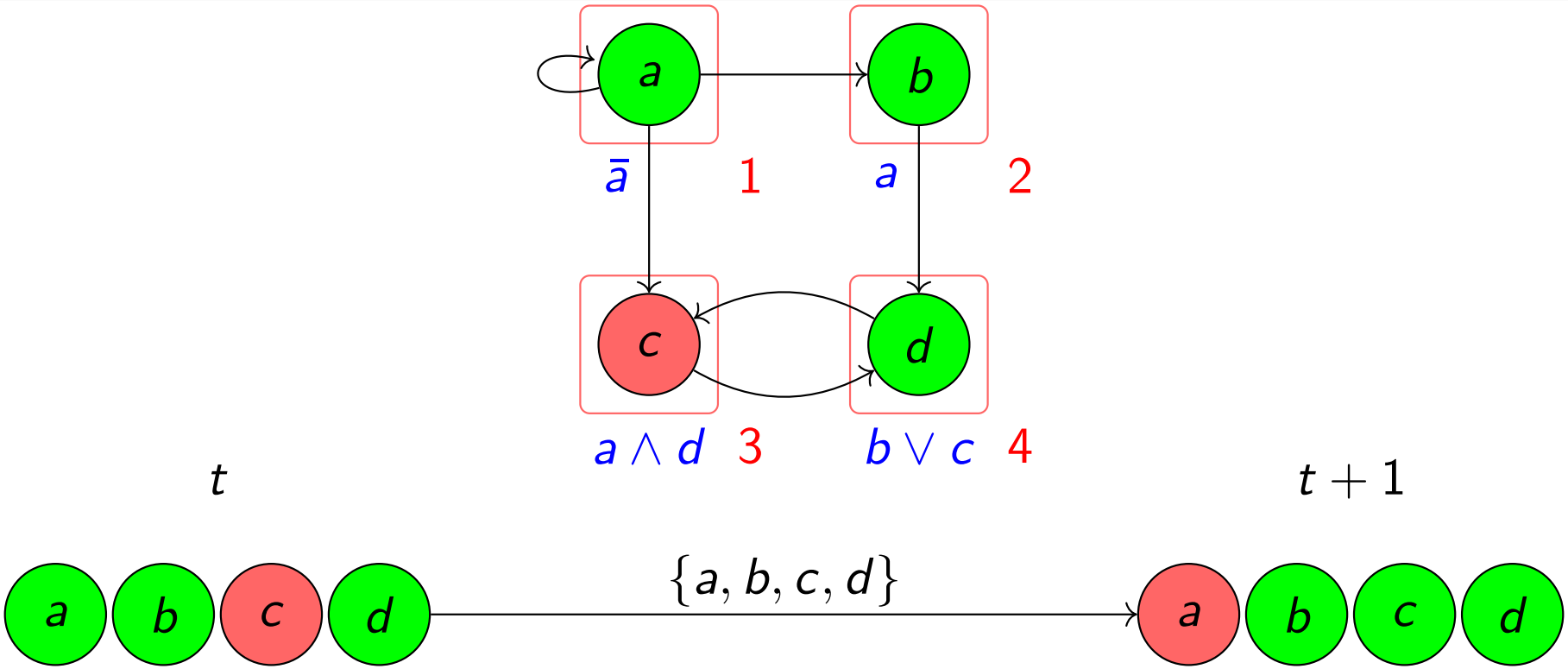

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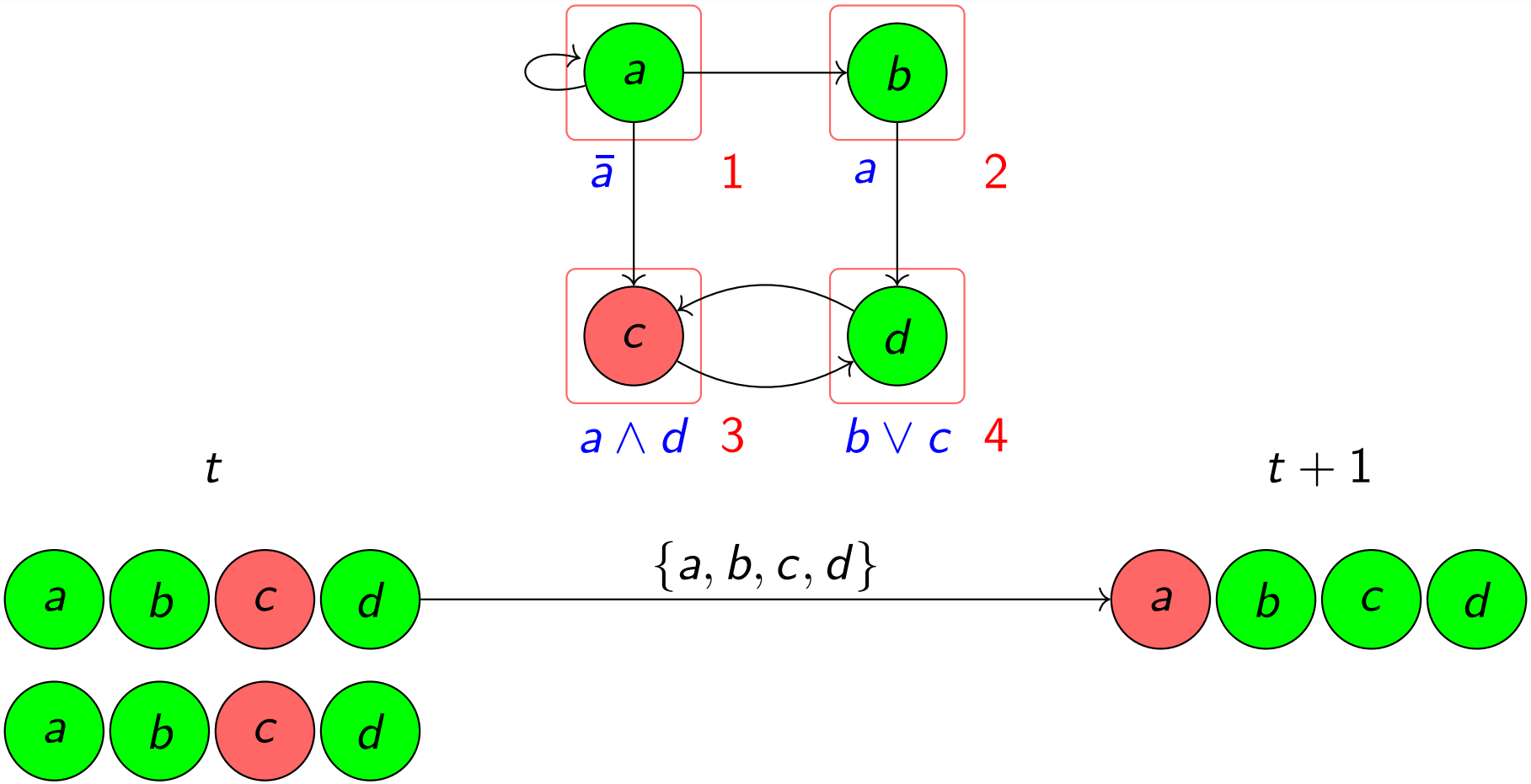

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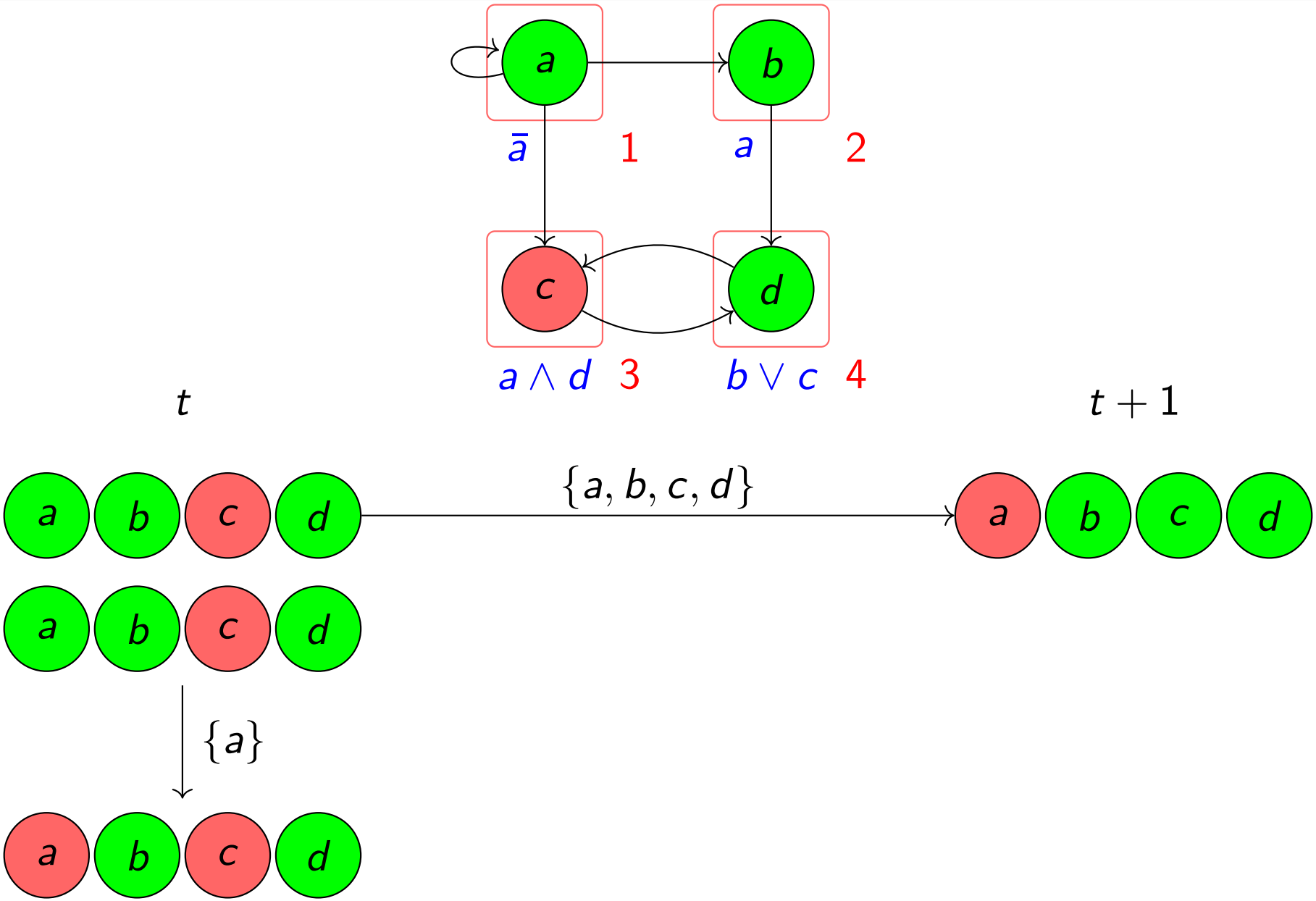

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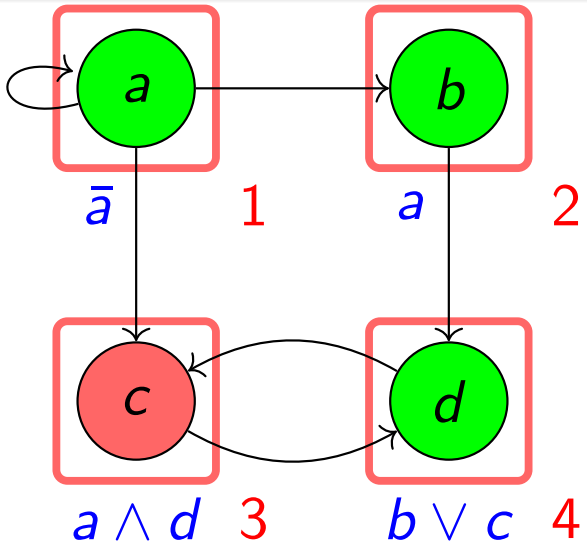

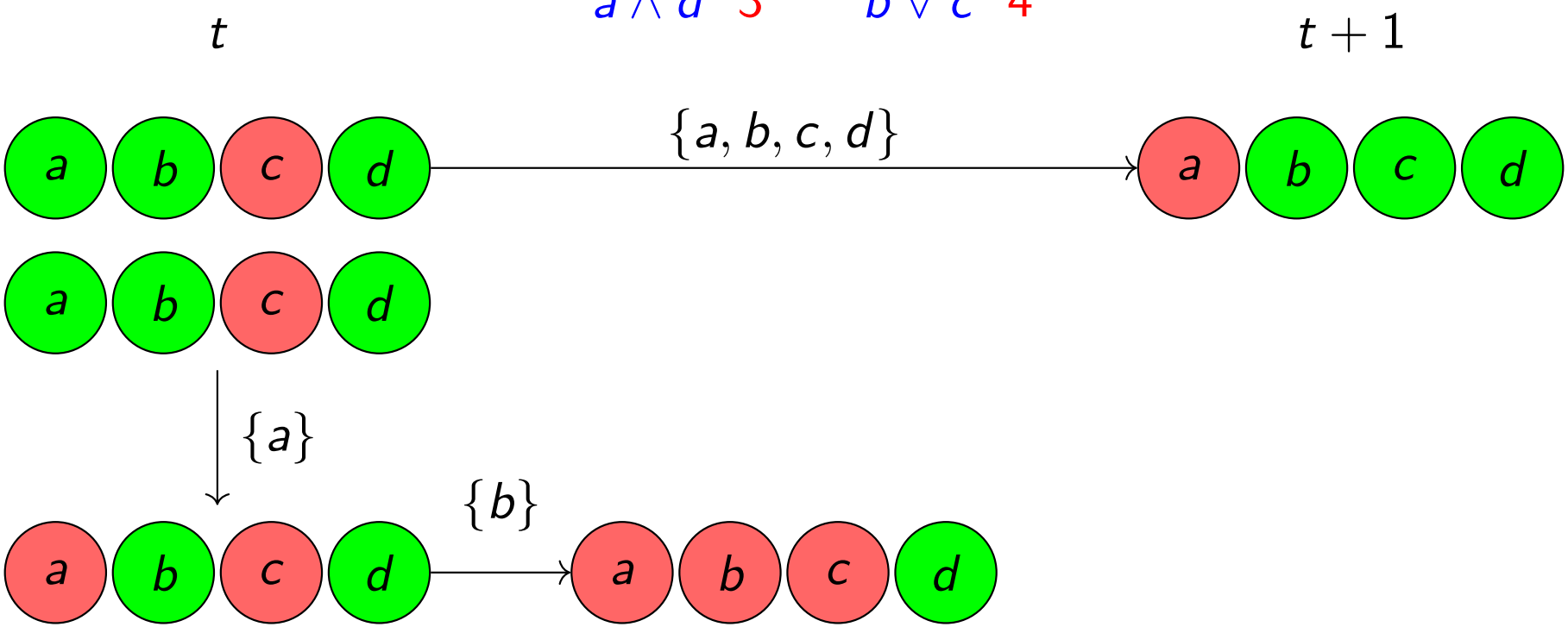

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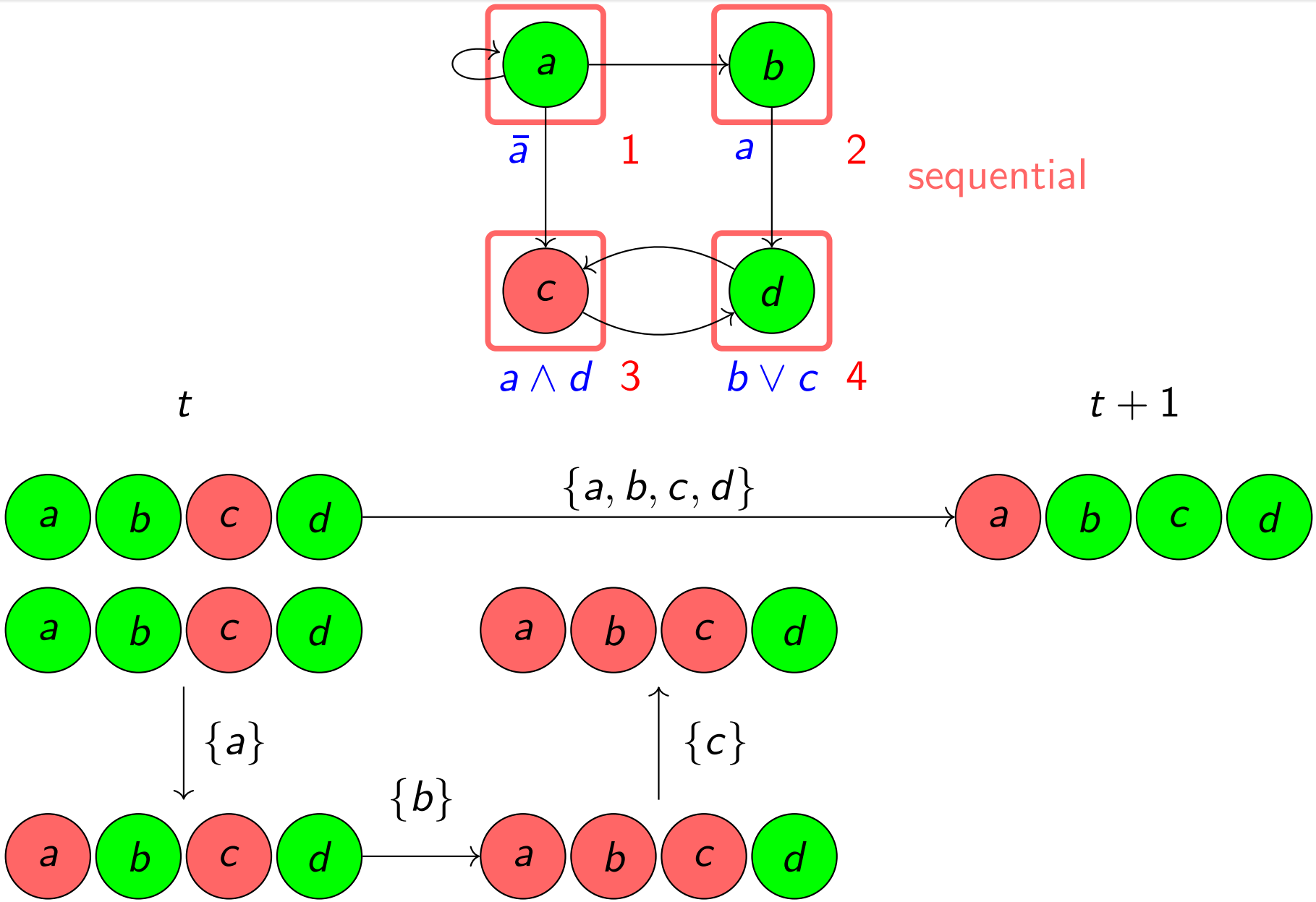

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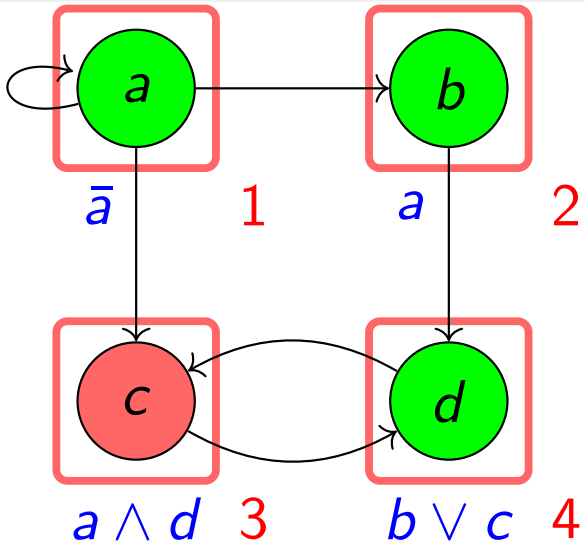
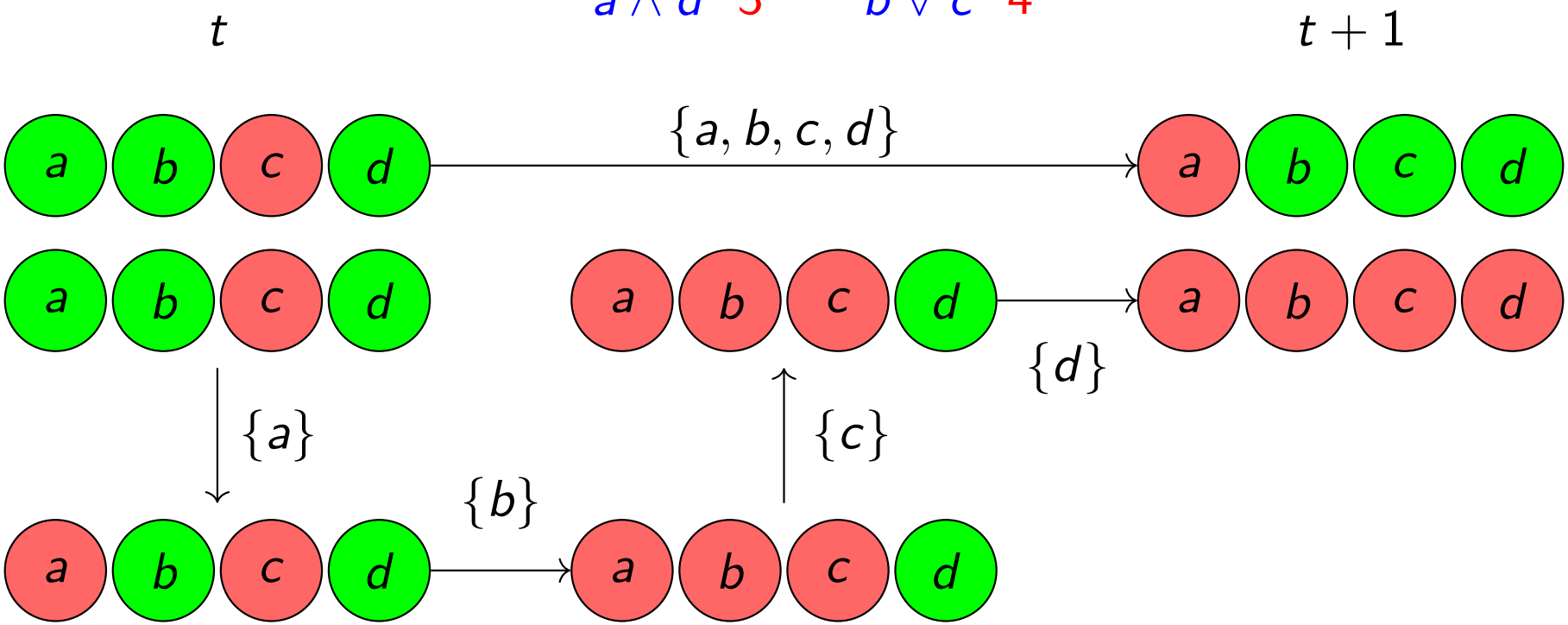
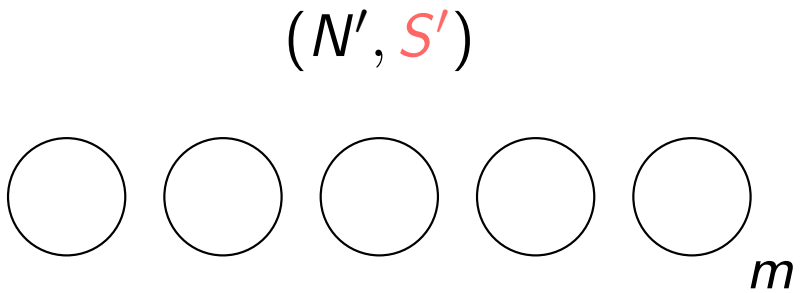




Intrinsic simulation



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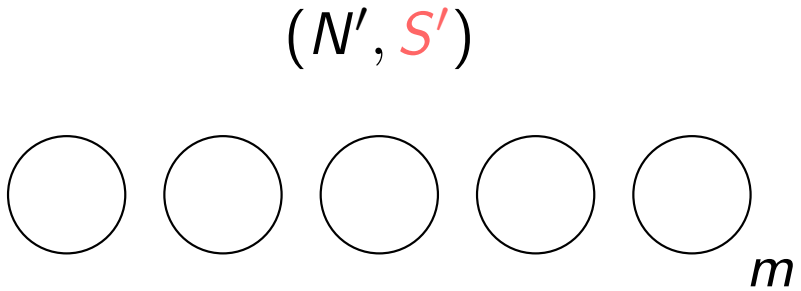
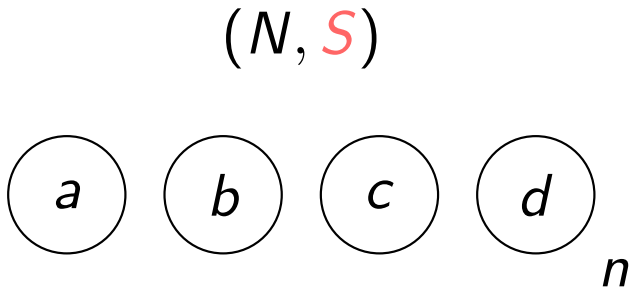
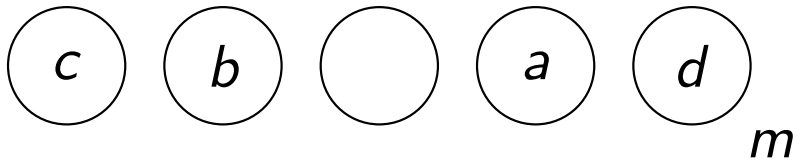


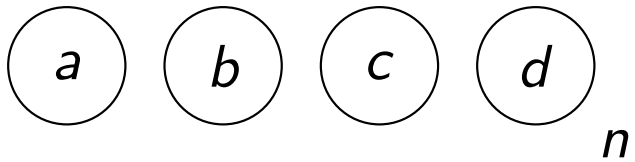


Intrinsic simulation

(N', S')



(N, S)



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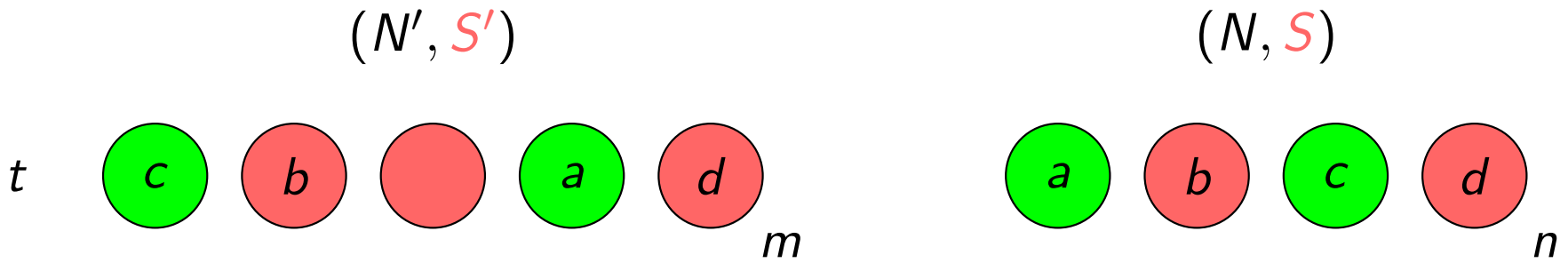

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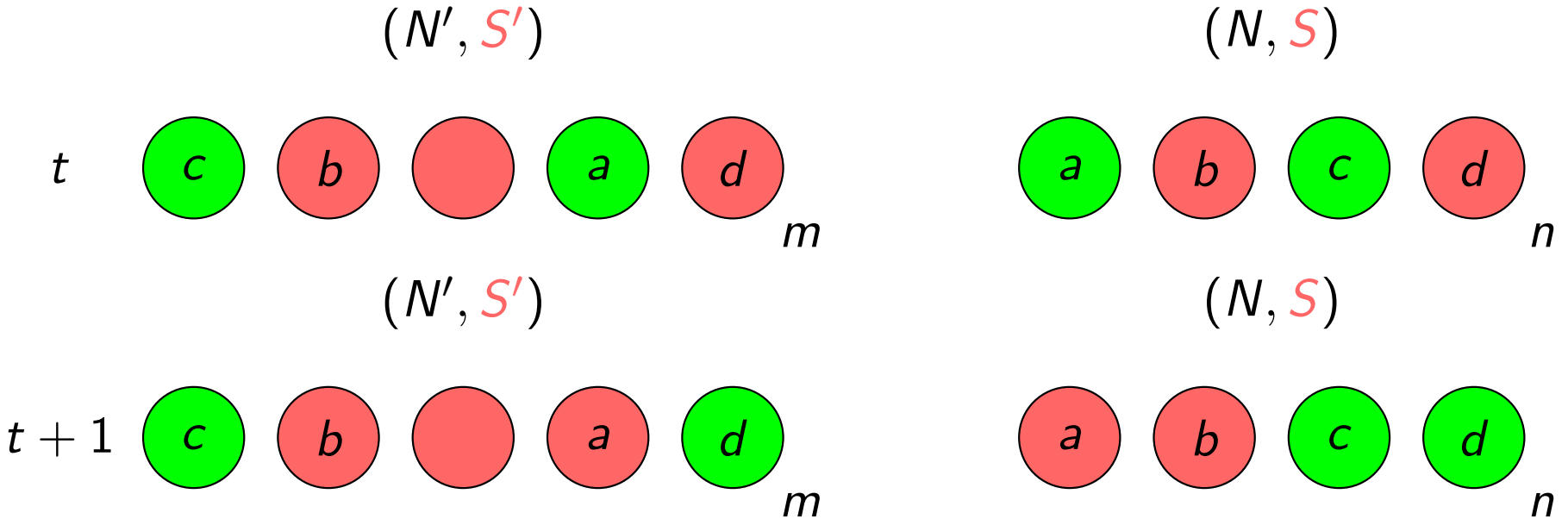

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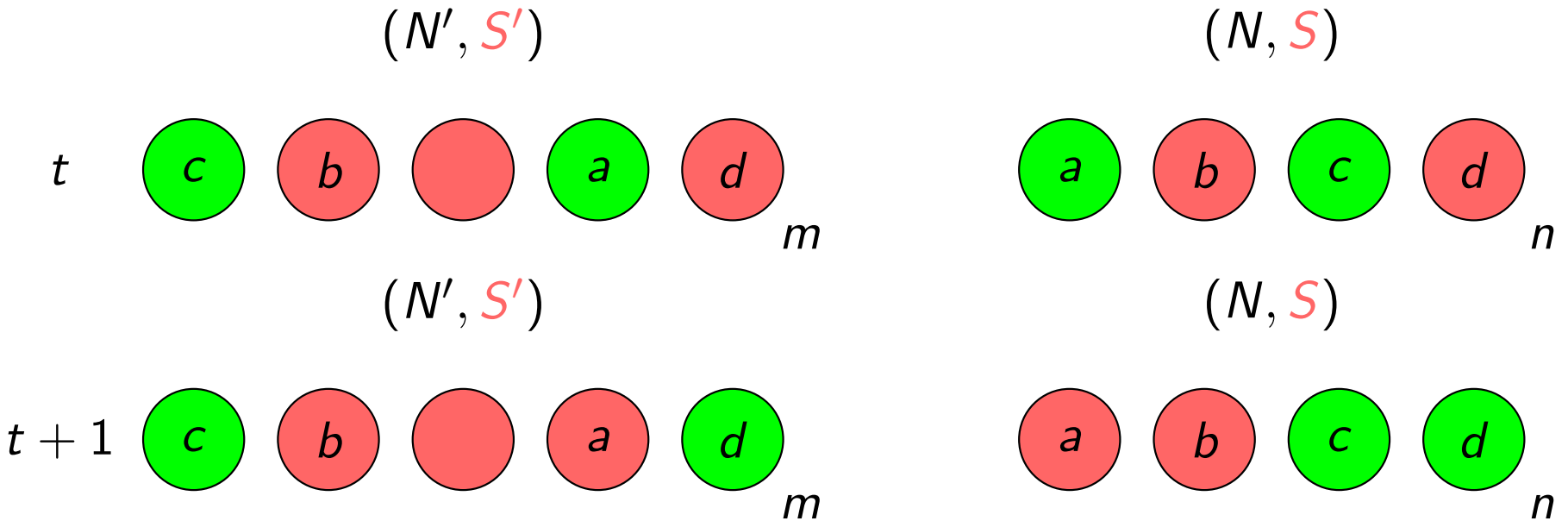
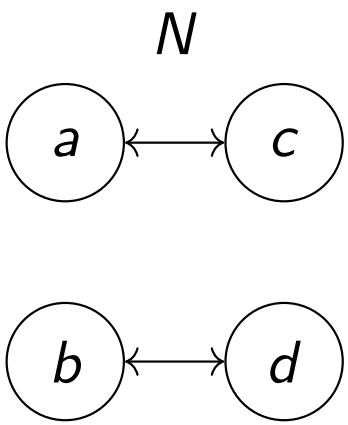


$$(N', S') \rhd (N, S)$$

The Cost of simulation K^+ and K



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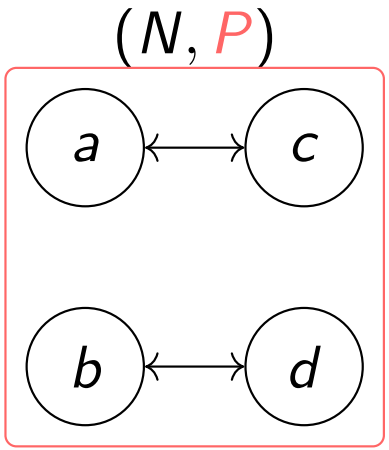

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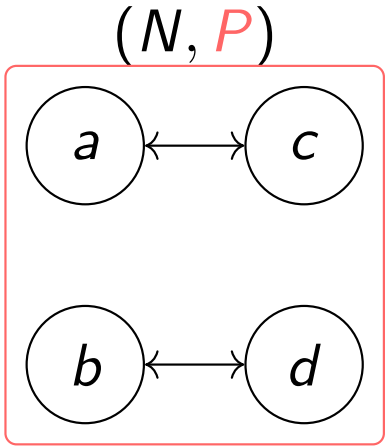

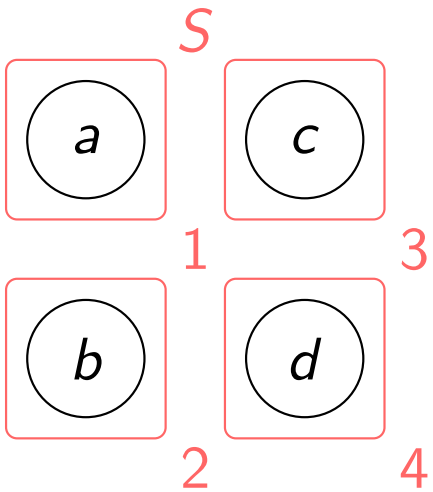

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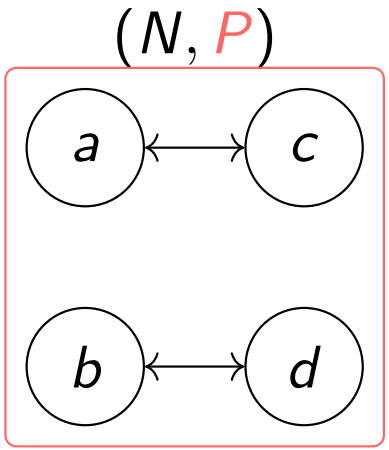

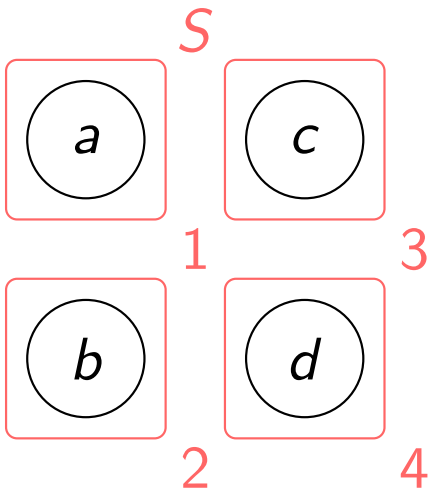

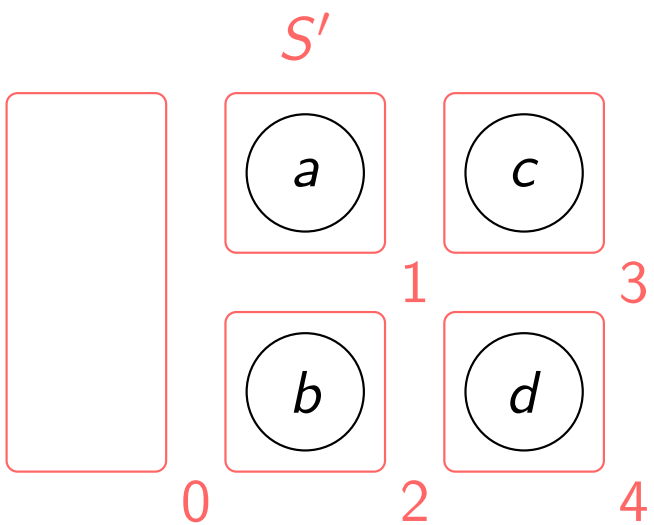

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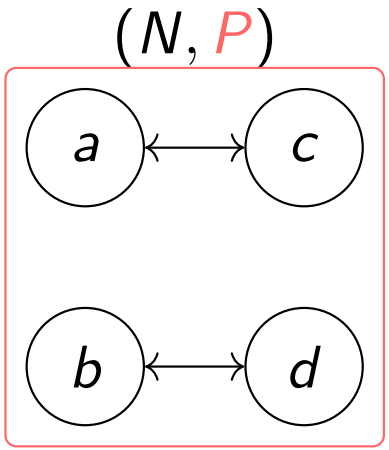

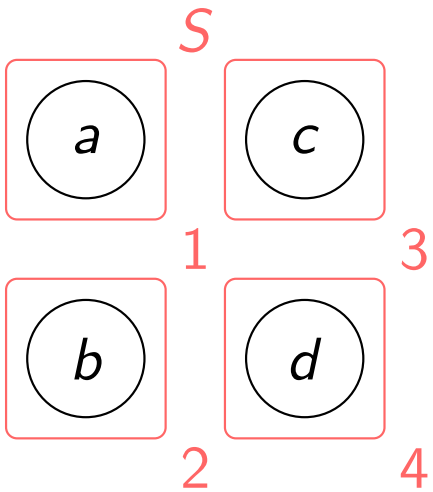

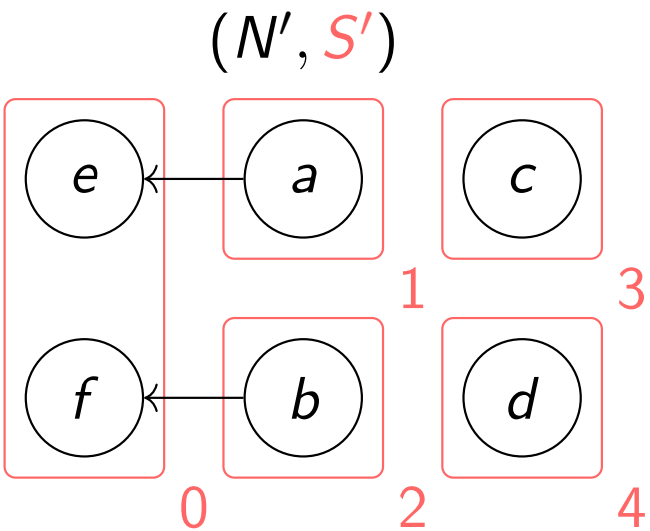

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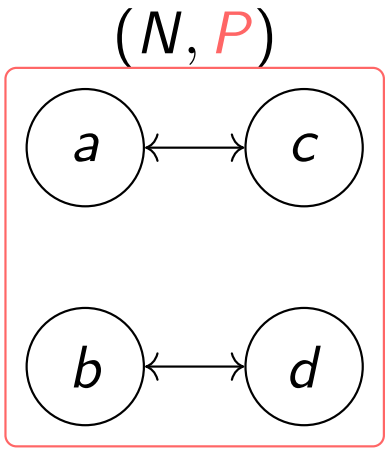

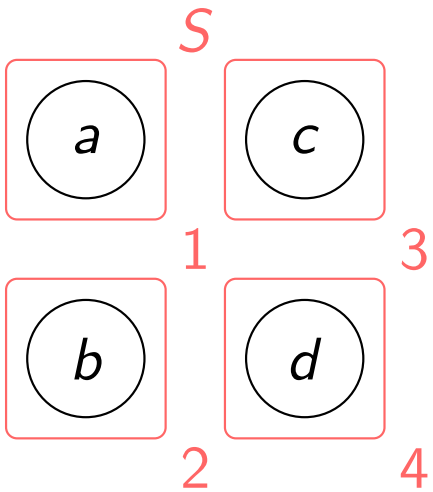

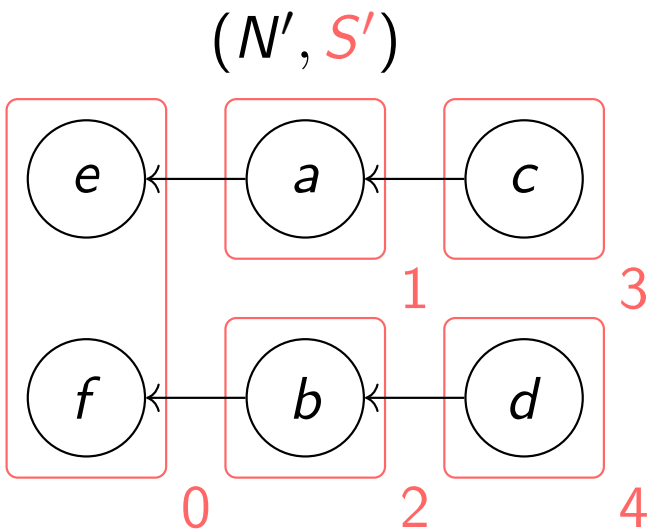

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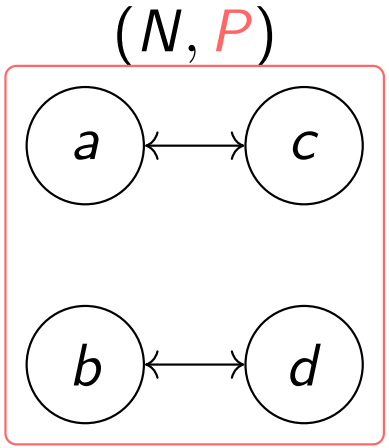

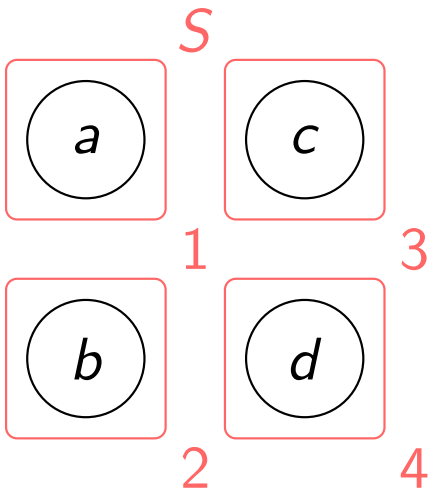

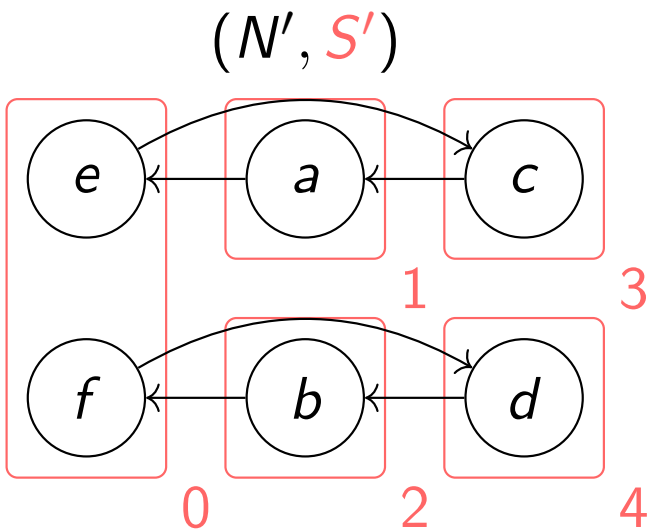

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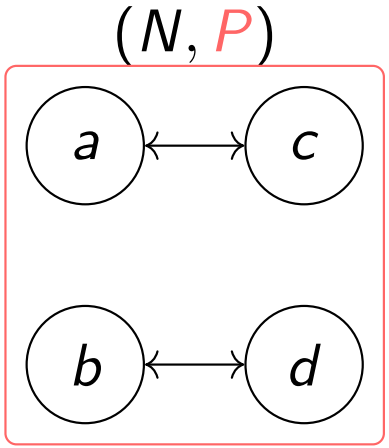
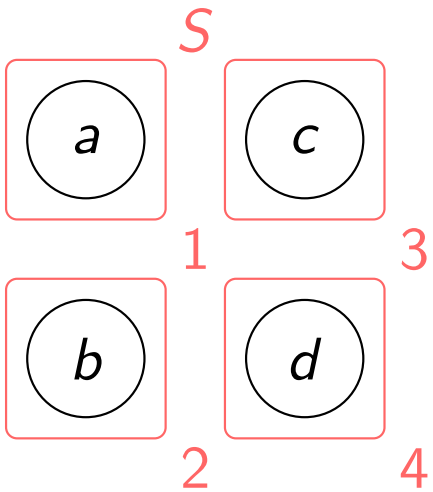
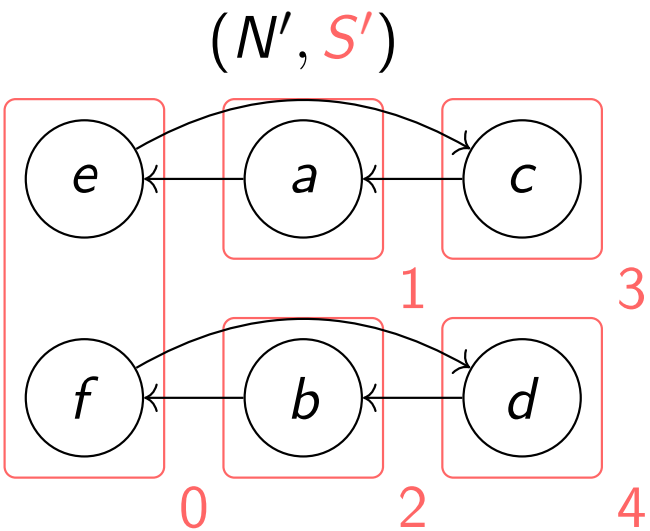
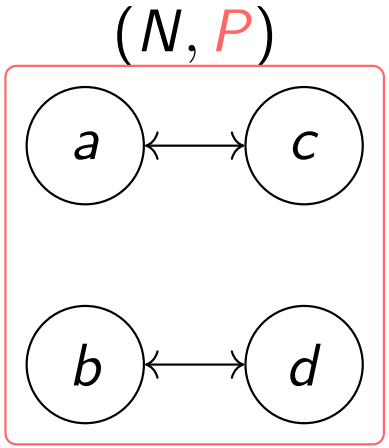


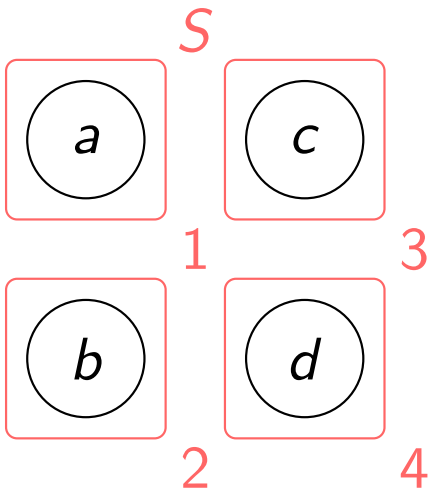


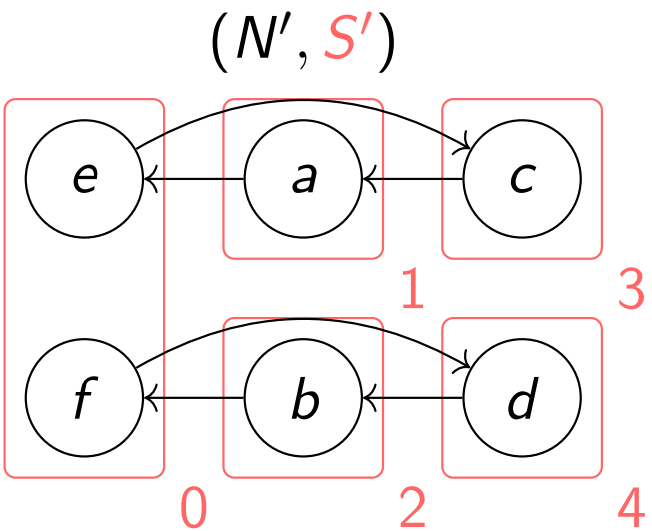


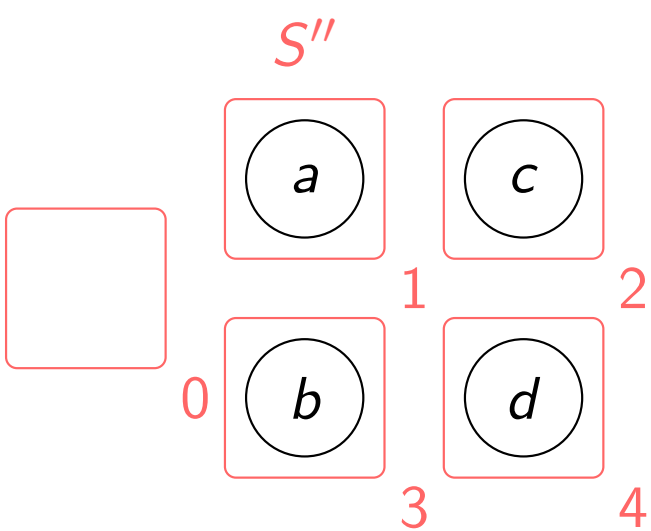
$K^+(N, S) \leq 2$

The Cost of simulation K^+ and K



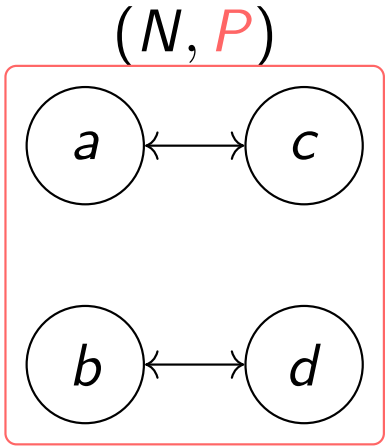


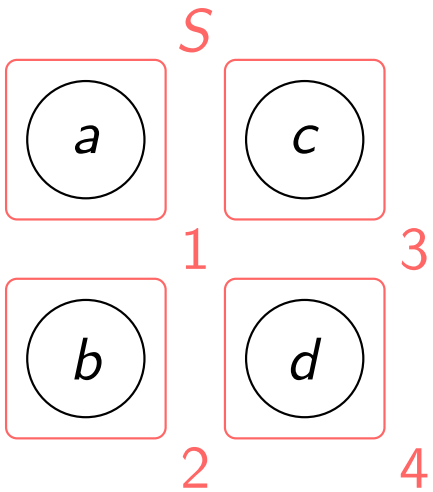


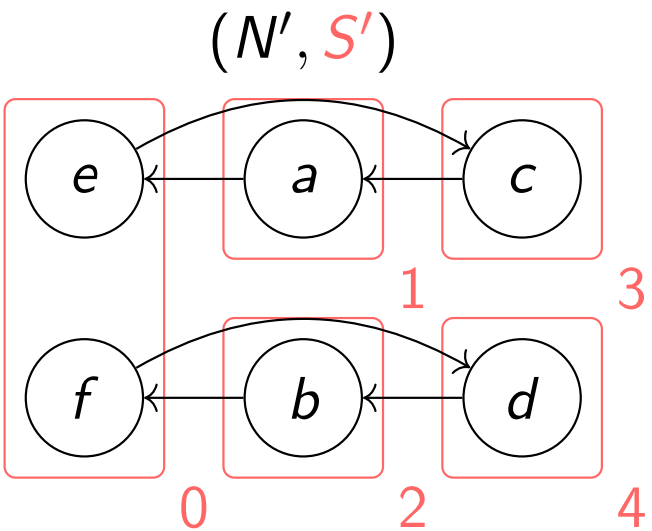


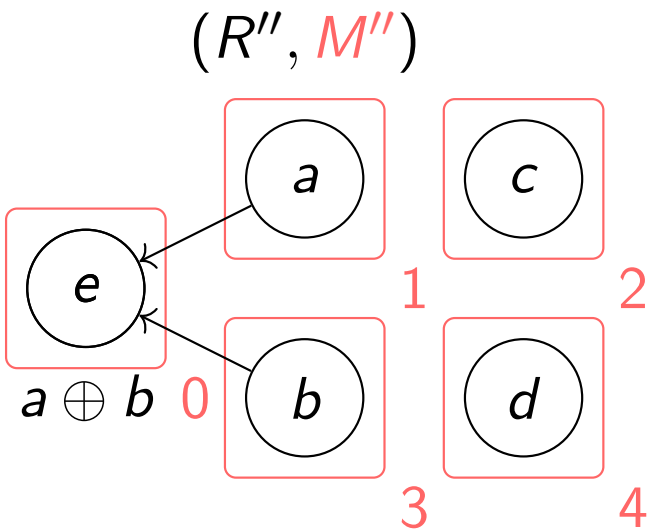
$K^+(N, S) \leq 2$

The Cost of simulation K^+ and K



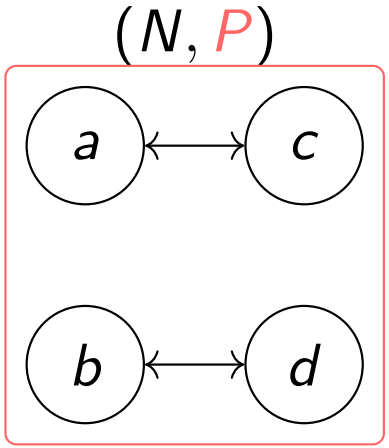


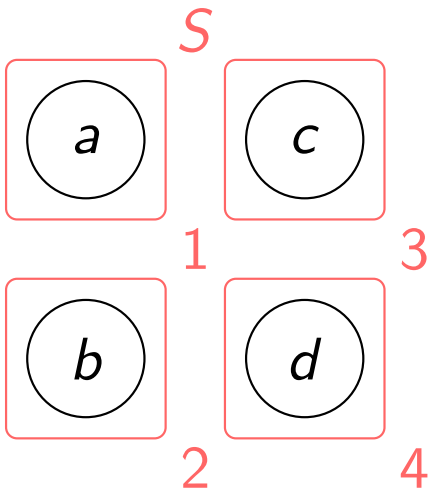


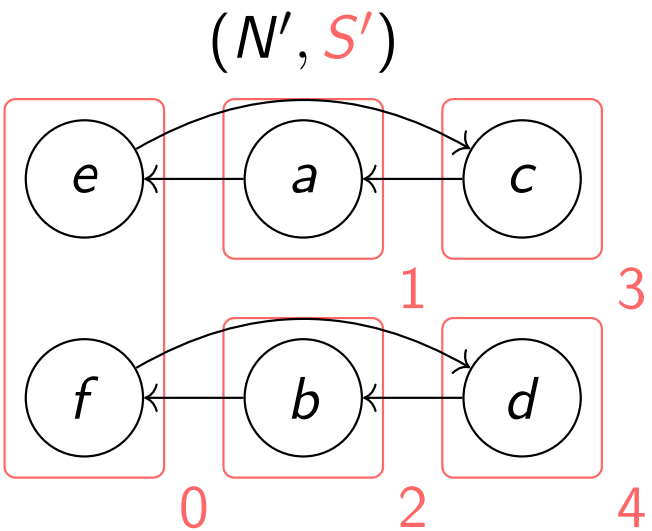


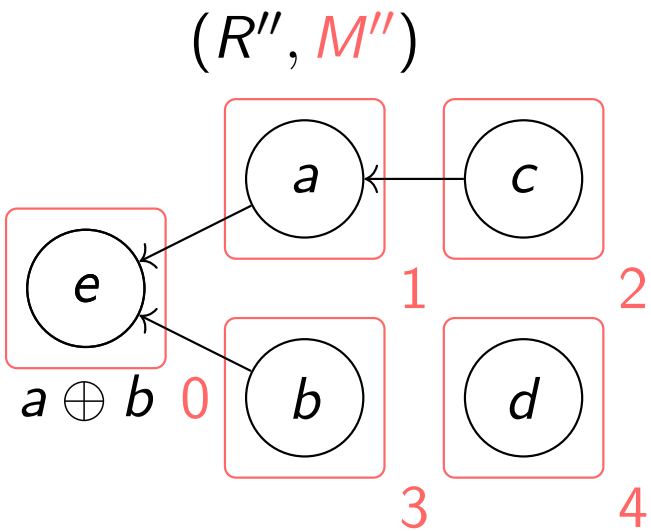
$K^+(N, S) \leq 2$

The Cost of simulation K^+ and K



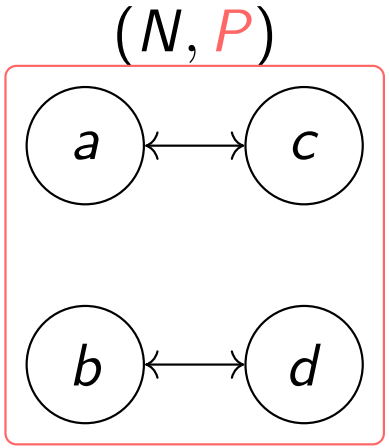


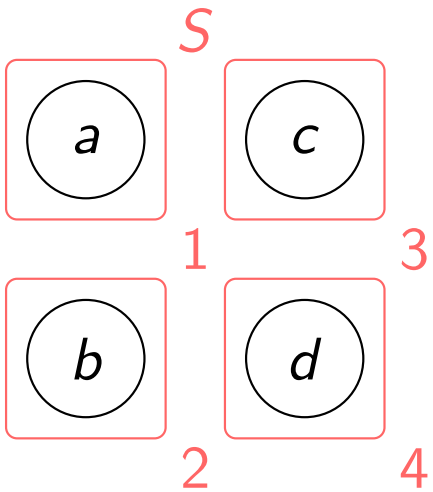


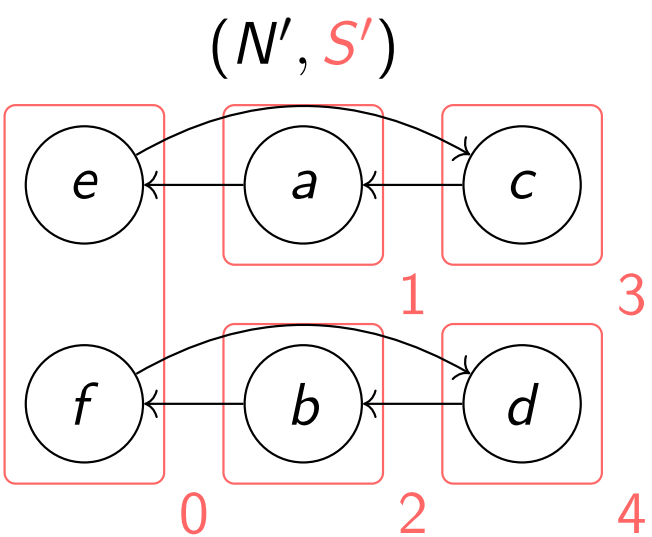


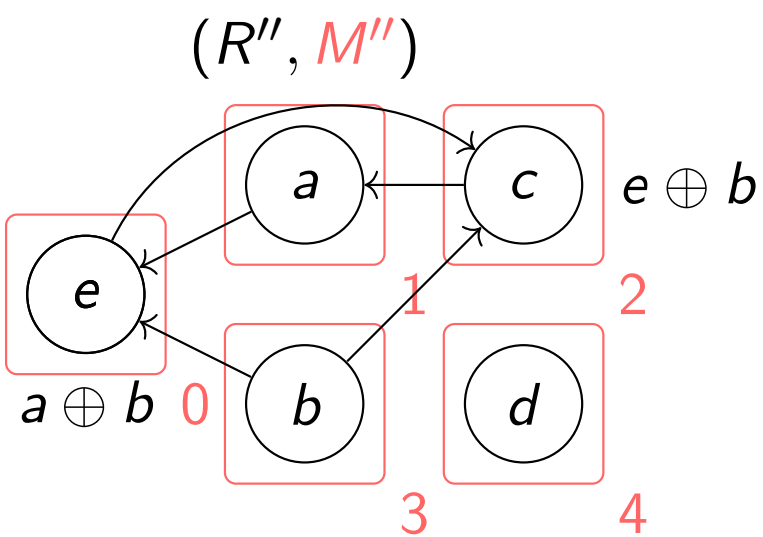
$K^+(N, S) \leq 2$

The Cost of simulation K^+ and K



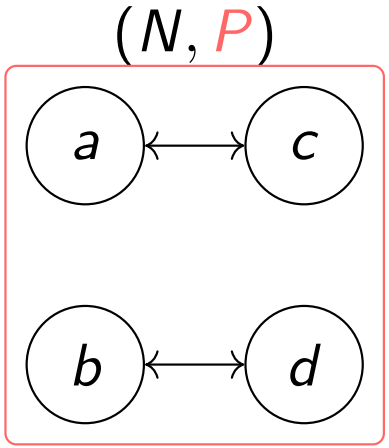


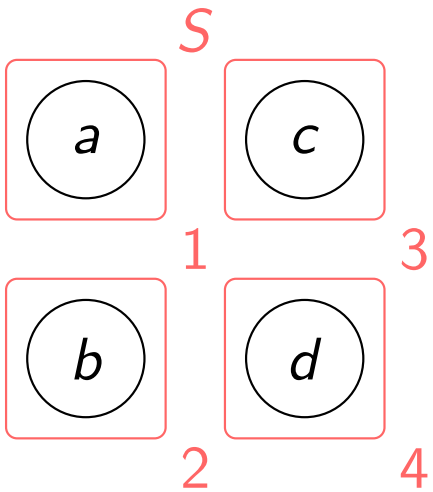


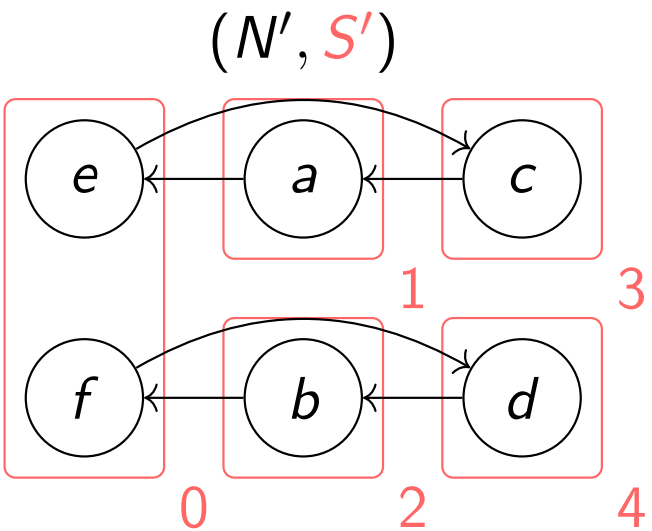


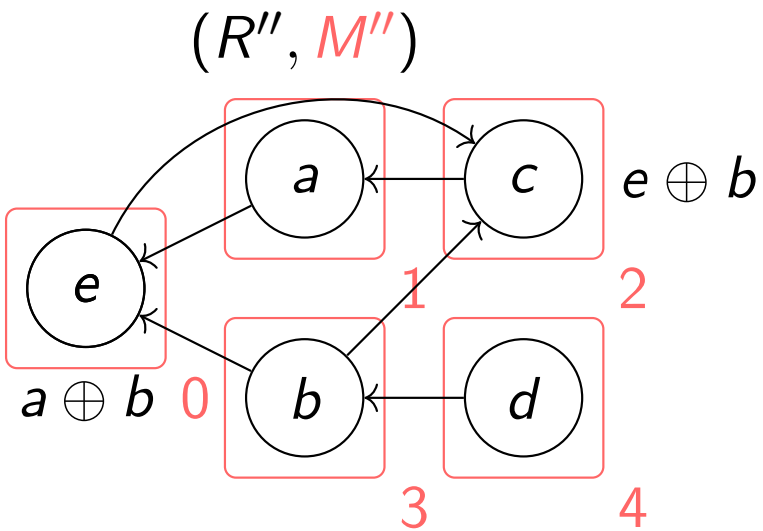
$K^+(N, S) \leq 2$

The Cost of simulation K^+ and K



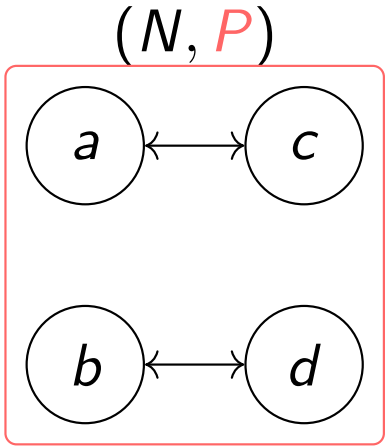


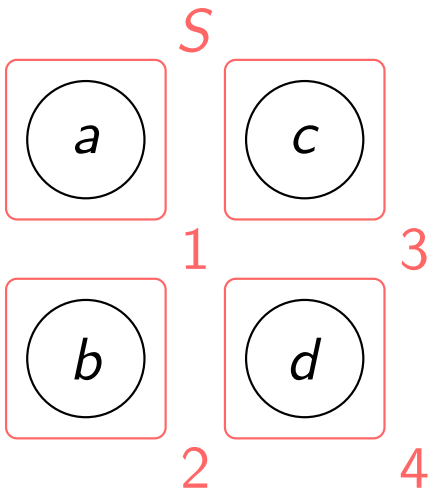


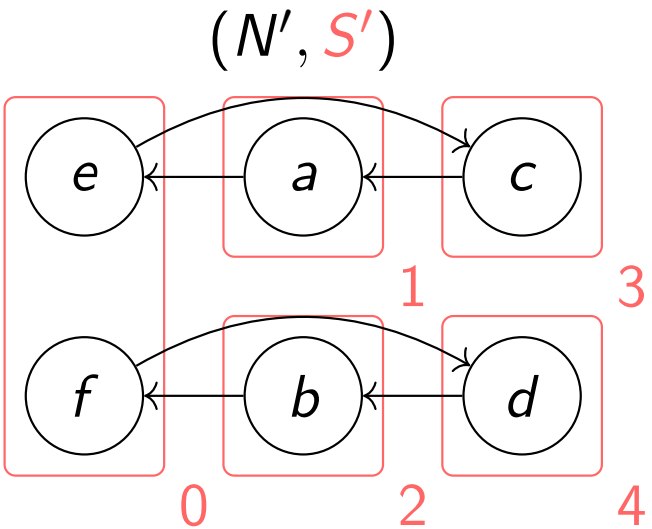


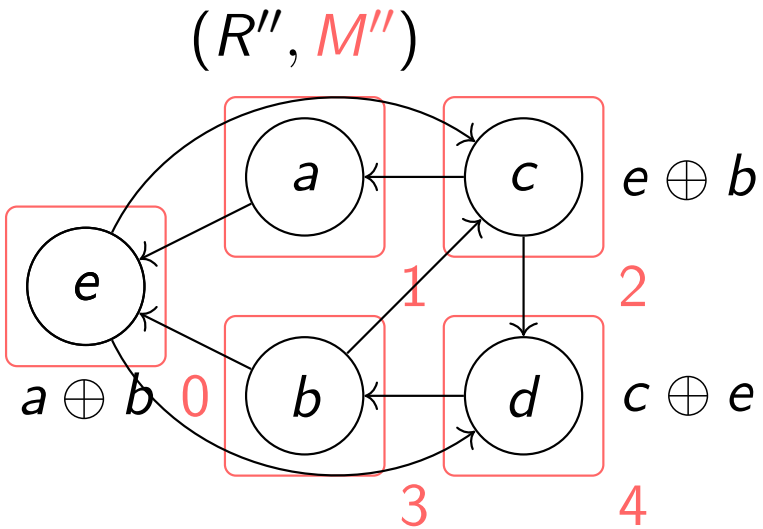
$K^+(N, S) \leq 2$

The Cost of simulation K^+ and K



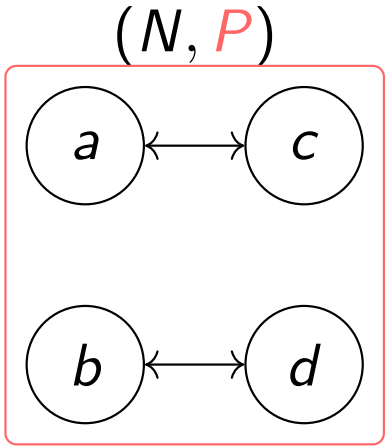


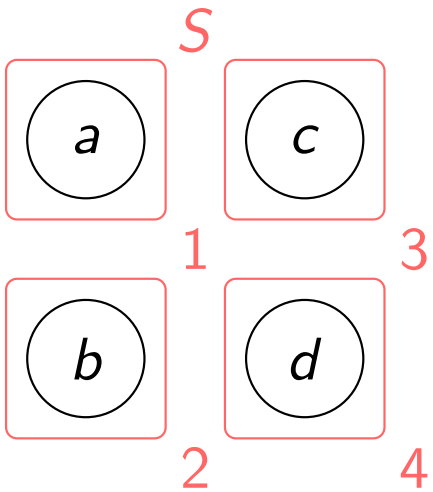


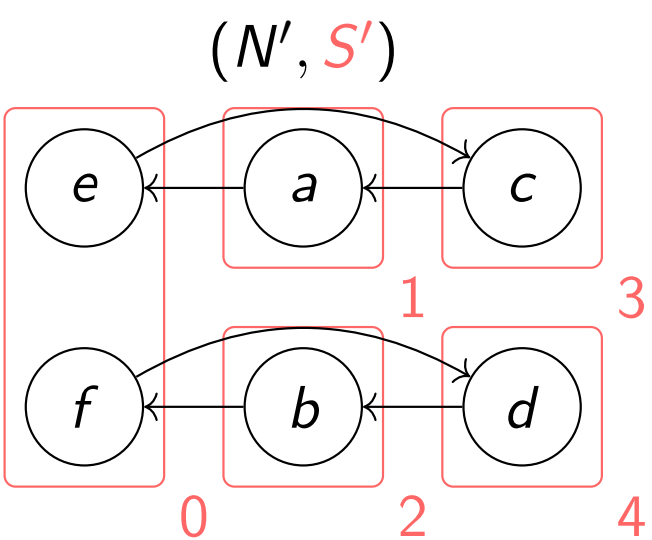


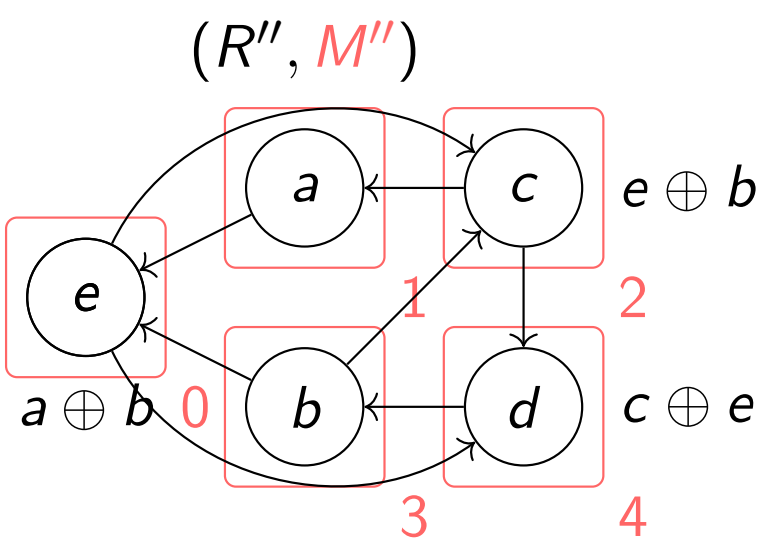
$K^+(N, S) \leq 2$

The Cost of simulation K^+ and K





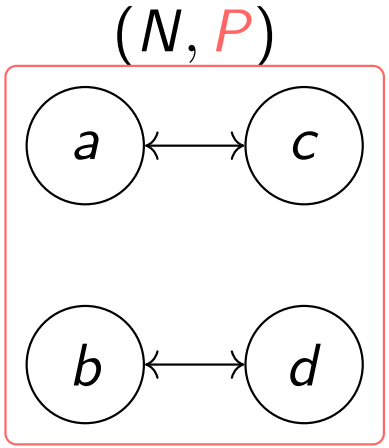


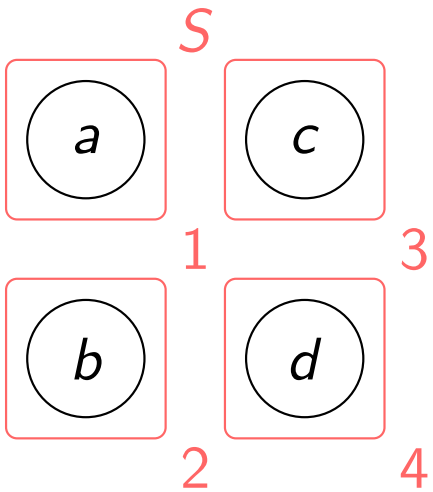


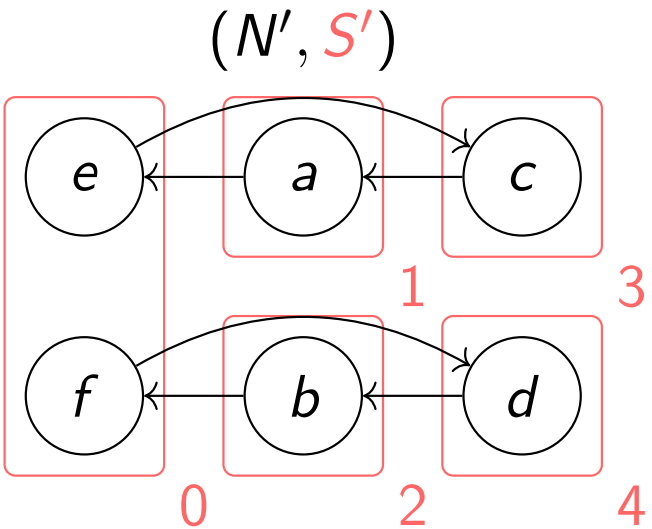
$K^+(N, S) \leq 2$

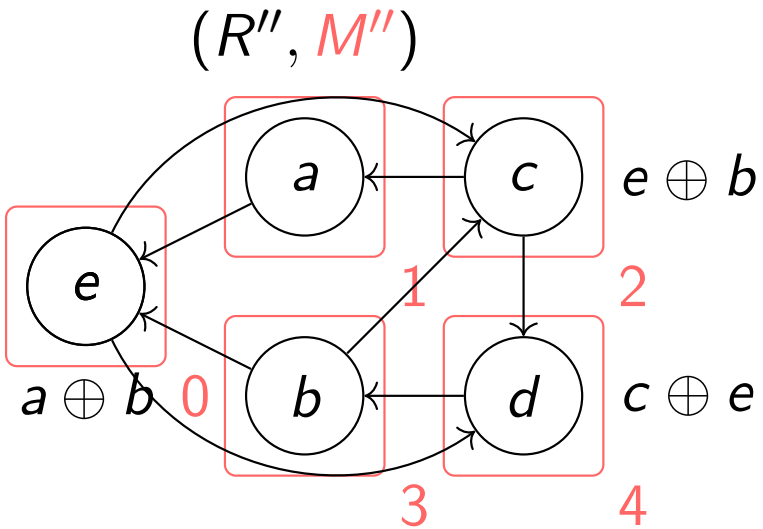
$K(N, S) \leq 1$

The Cost of simulation K^+ and K



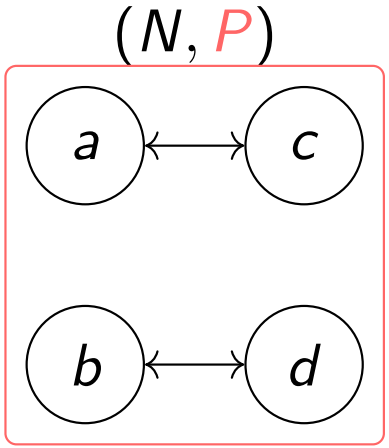


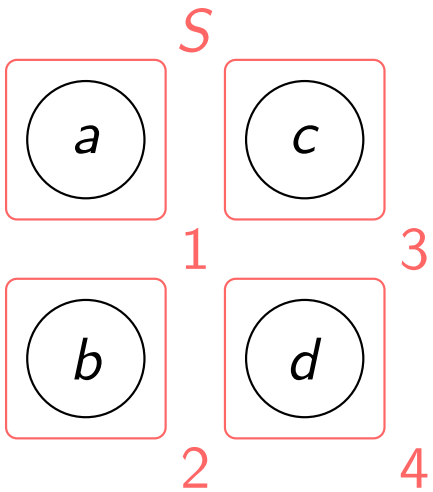


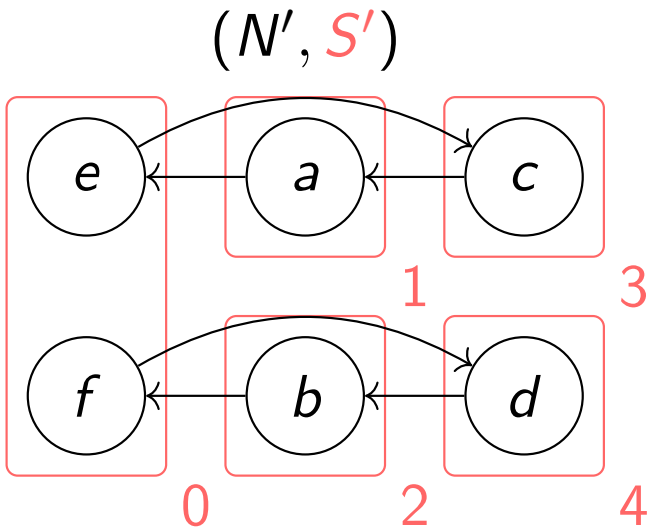


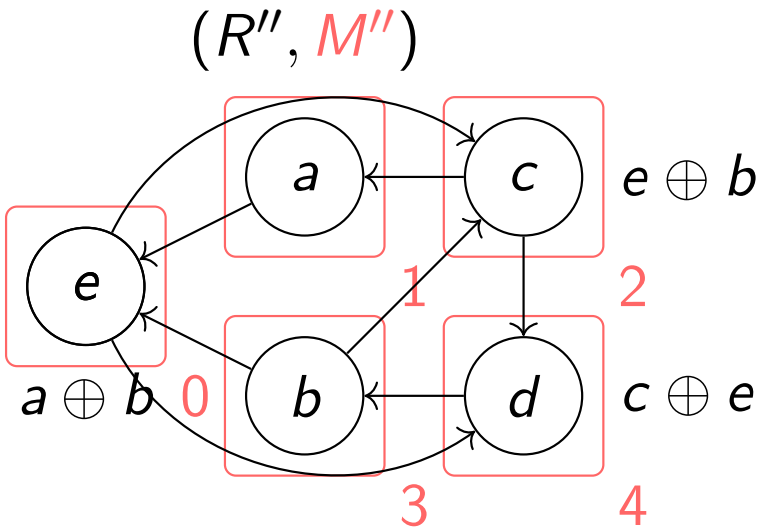
$K^+(N, S) \leq 2$ $K^+(N, S) \geq K(N, S)$ $K(N, S) \leq 1$

The Cost of simulation K^+ and K



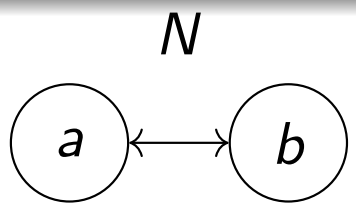




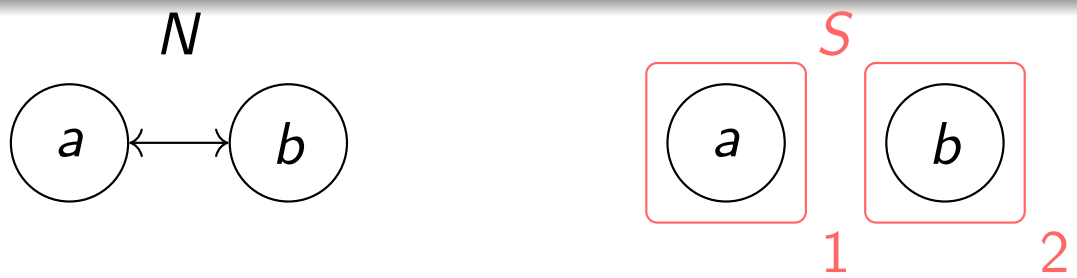


$K^+(N, S) = 2$ $K^+(N, S) \geq K(N, S)$ $K(N, S) = 1$

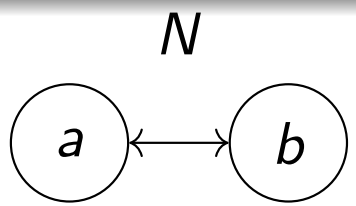
Confusion graph $G_{N,S}$

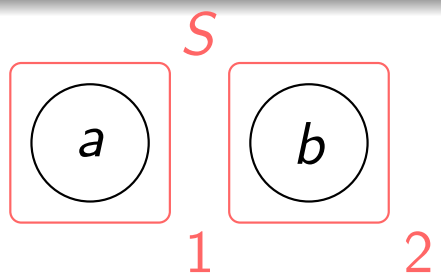


Confusion graph $G_{N,S}$



Confusion graph $G_{N,S}$





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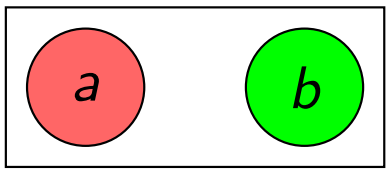
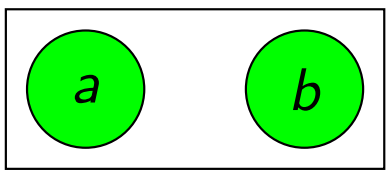
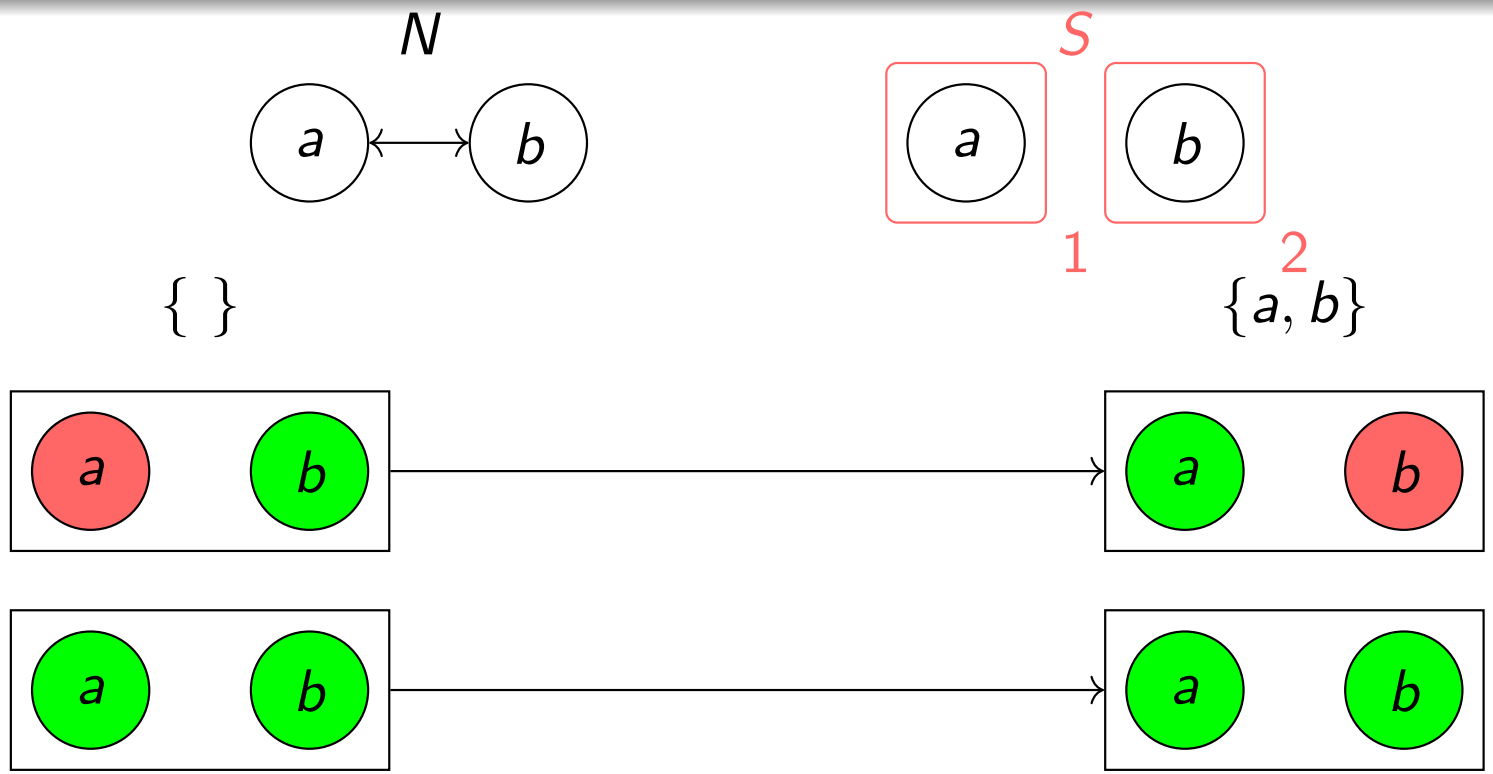
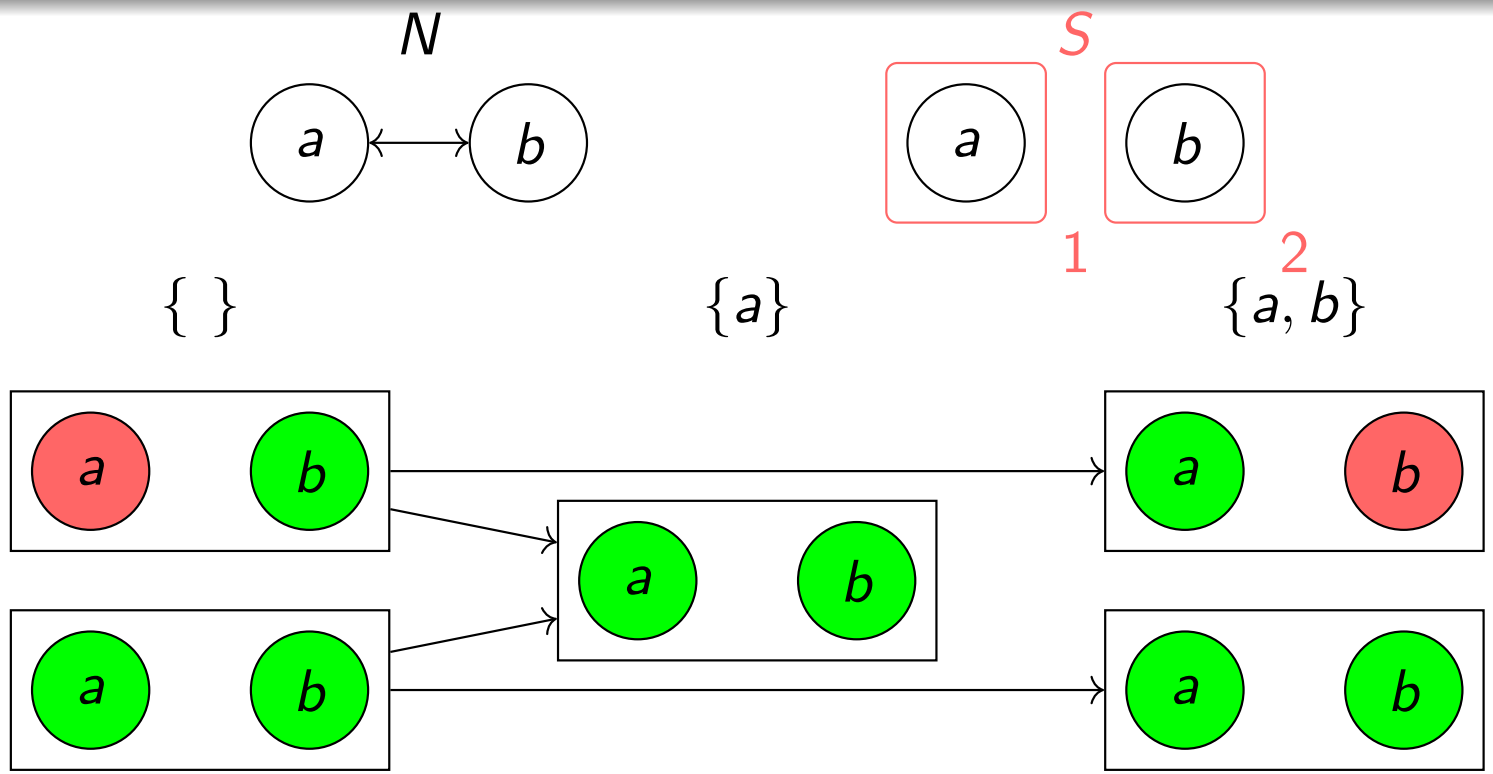




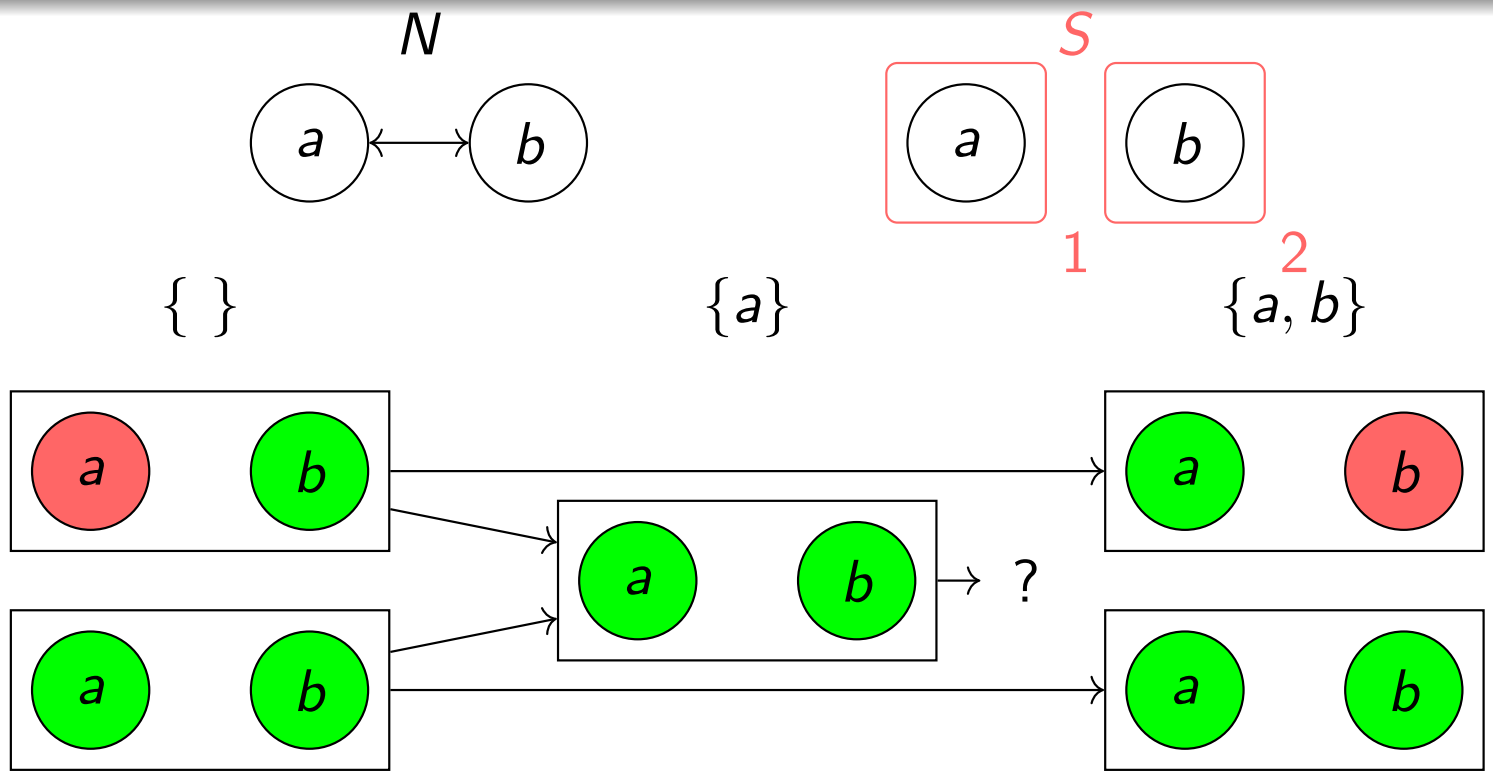
Confusion graph $G_{N,S}$



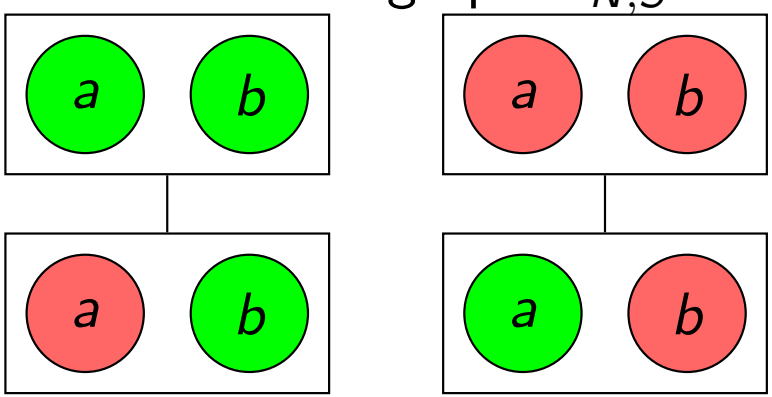
Confusion graph $G_{N,S}$



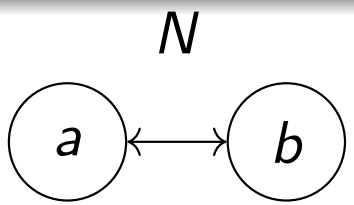
Confusion graph $G_{N,S}$

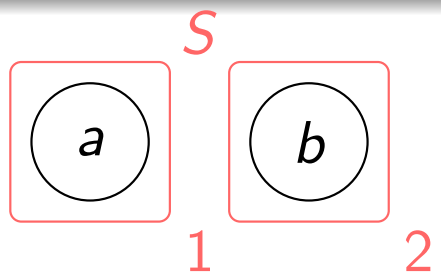


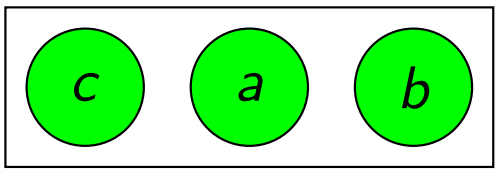
Confusion graph $G_{N,S}$:

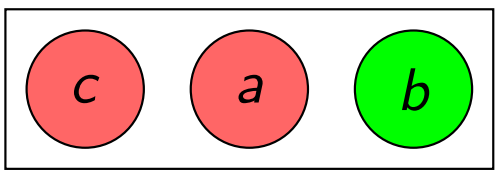


Confusion graph $G_{N,S}$

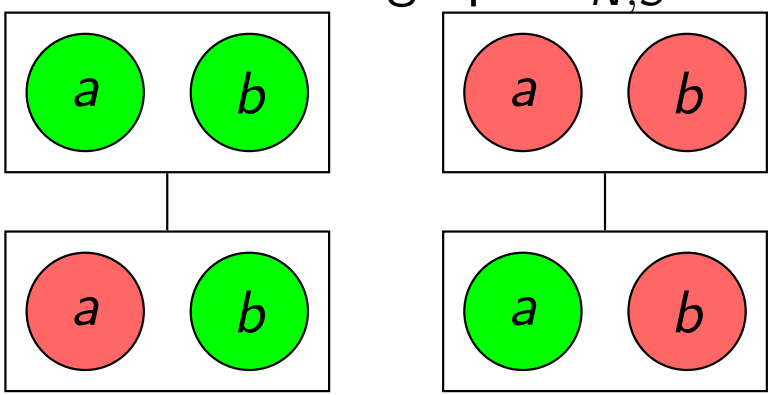




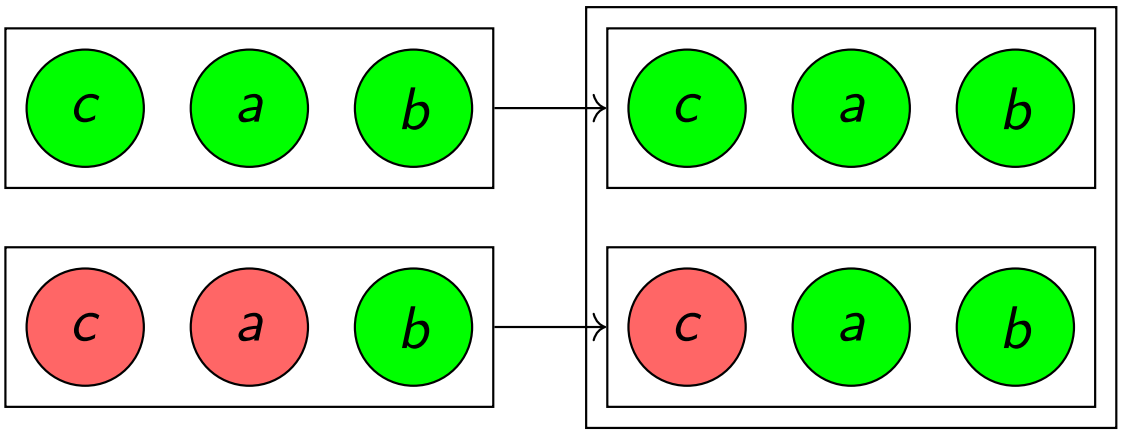




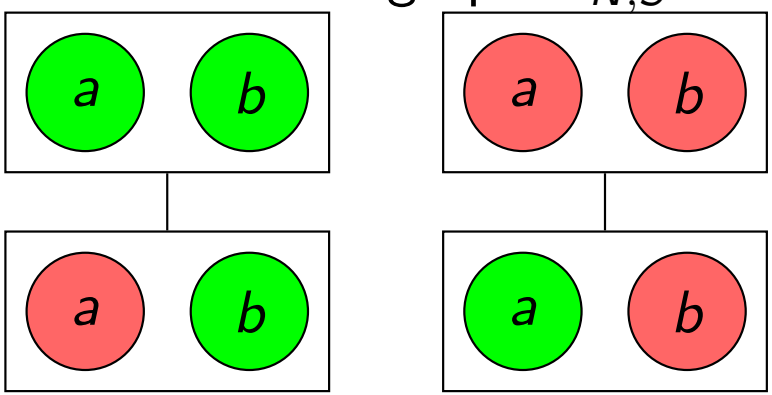
Confusion graph $G_{N,S}$:



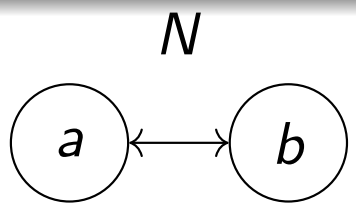
Confusion graph $G_{N,S}$

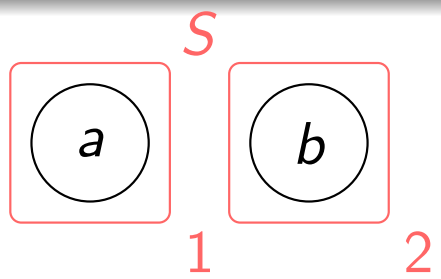


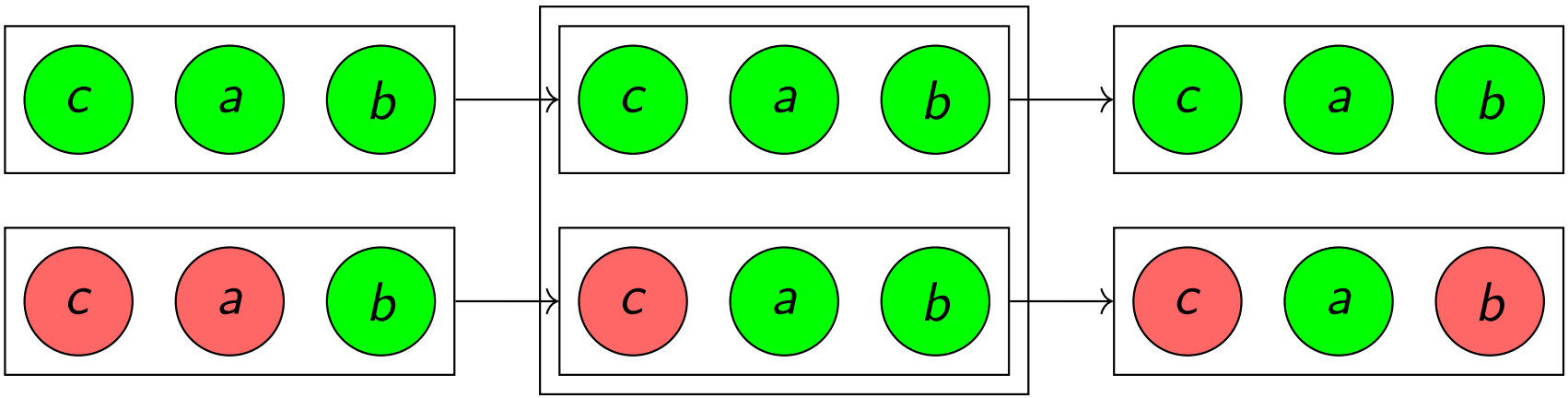
Confusion graph $G_{N,S}$:



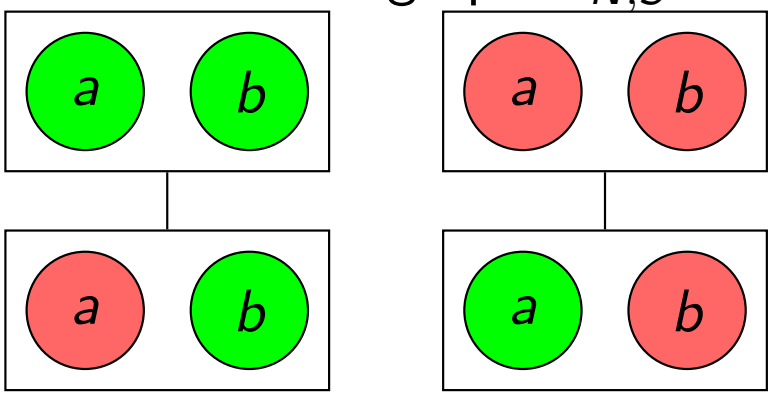
Confusion graph $G_{N,S}$



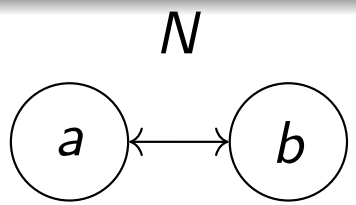


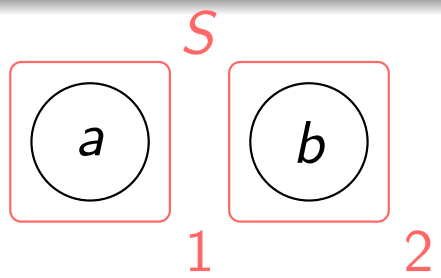


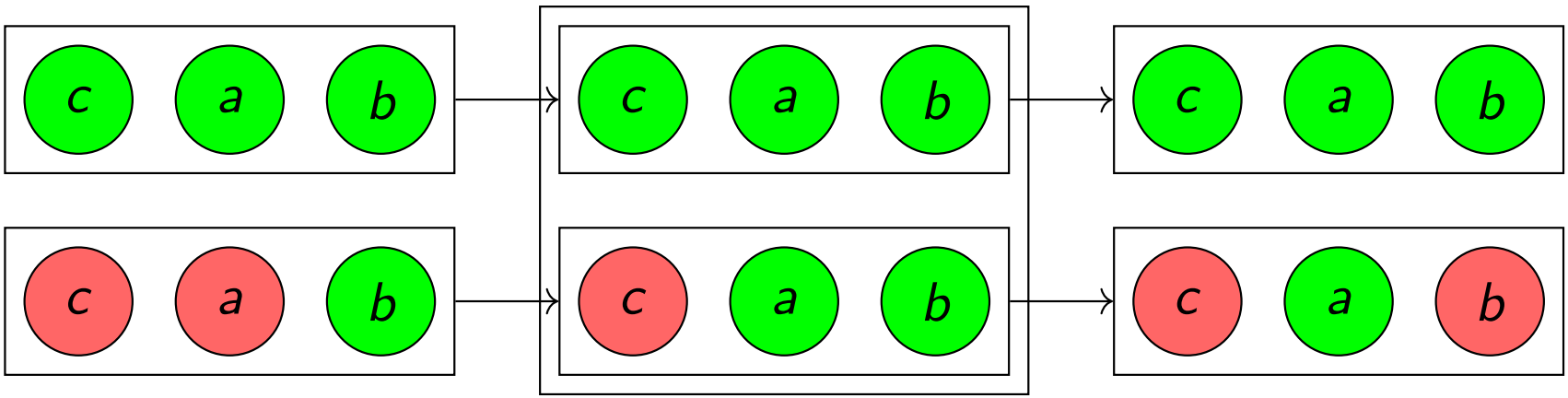
Confusion graph $G_{N,S}$:



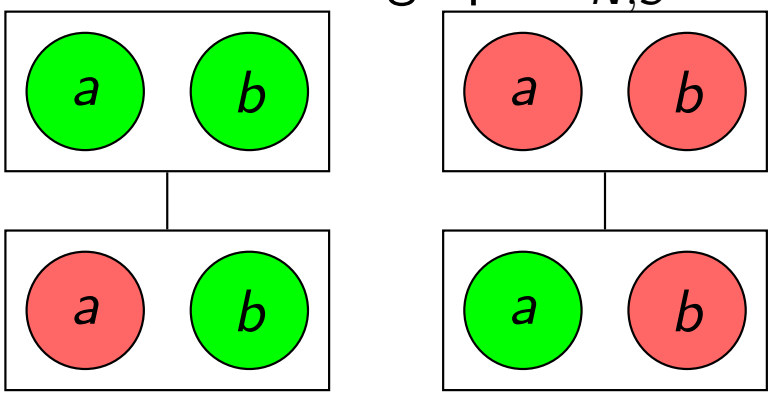
Confusion graph $G_{N,S}$





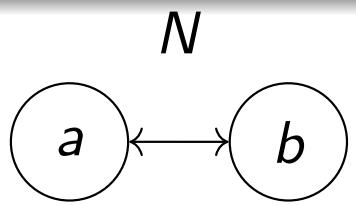


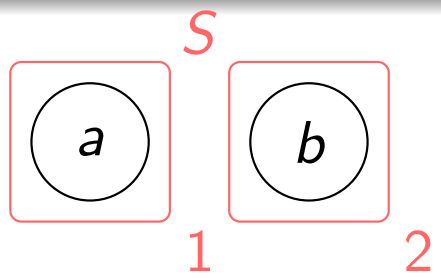
Confusion graph $G_{N,S}$:

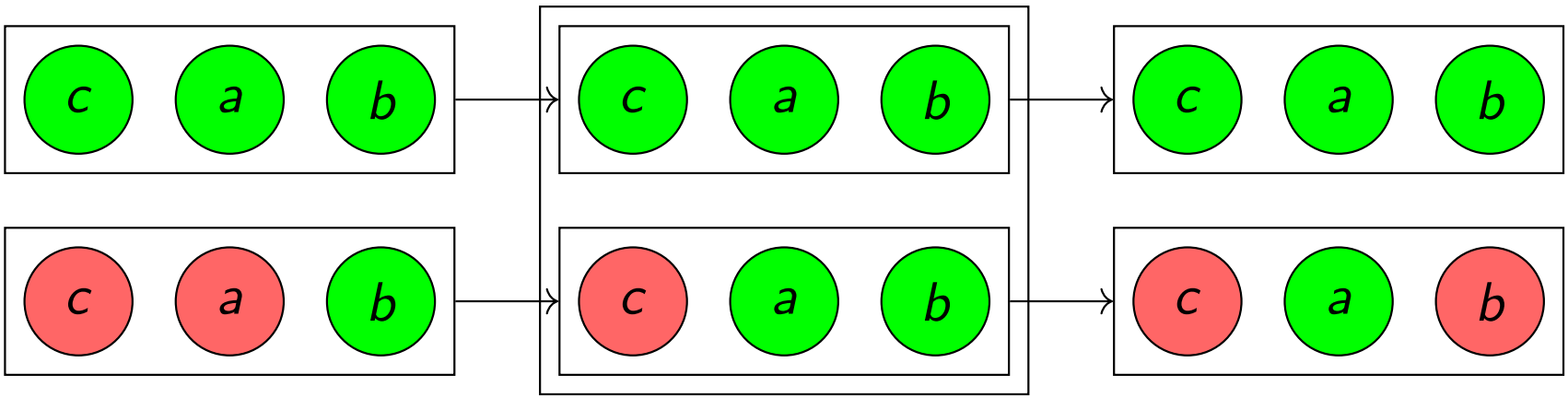


Lemma. $K^{+}_{N,S} \geq \lceil \log_2(\chi(G_{N,S})) \rceil$

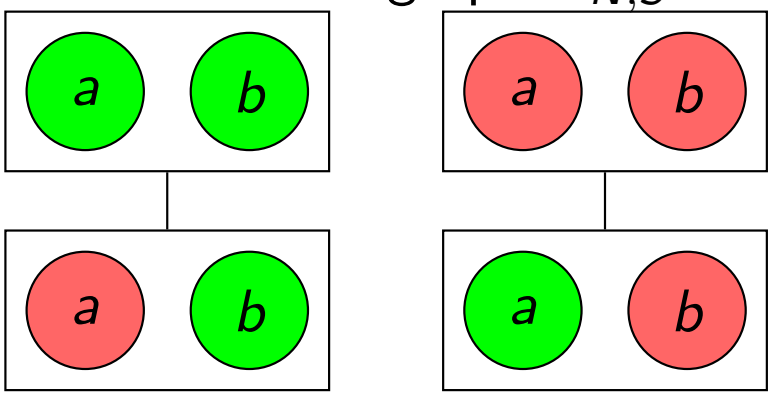
Confusion graph $G_{N,S}$







Confusion graph $G_{N,S}$:



Theorem. $K^{+}_{N,S} = \lceil \log_2(\chi(G_{N,S})) \rceil$

Conclusion and ongoing work

Principal results :

- Regarding K_n^+ :
  - $K^+(N,S) = \log(\chi(G_{N,S}))$.
  - $\lfloor n/2 \rfloor \leq K_n^+ \leq 2n/3 + 2$.
  - $\omega(G_{N,S}) \leq \lfloor n/2 \rfloor$.
  - If N is bijective then $K_n^+ \leq \lfloor n/2 \rfloor$.
- Regarding K_n :
  - $\lfloor n/3 \rfloor \leq K_n \leq K_n^+$.
  - $K_n \leq \tau$.